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Words of Commendation

The publisher and editor of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION appreciate criticisms that may help them better their product. Of course, they are human enough also to relish letters of commendation such as those which follow. Constructive criticism helps us improve — judicious commendation tells us when we are accomplishing something. We appreciate both criticisms and commendations.

"The general set-up of the 1932 edition of *Bruce's School Shop Annual* is exceptionally fine this year and you are to be congratulated upon such a fine piece of work. The book certainly is a valuable asset in any shop, and should meet with universal commendation.

"It might be interesting to you to relate a little experience that I had with the copy of last year. Our state department notified us that a man would visit us with the idea of securing information relative to the necessary equipment for a vocational junior high school. When the representative arrived, I gave him a copy of the *Annual* of 1931 and pointed out to him the standards which you have established for the very type of school that he was interested in. He then informed me that, to his mind, his trip had been wasted as all the data that he needed was incorporated in the book and that he certainly would supply himself with a copy at once. It is unfortunate that more such departments cannot avail themselves of this book, as we would probably have fewer of the questionnaires floating through the mails." — *T. A.*

"Just a word of comment on the new style of cover of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine.

"The scenes of industry are now clear of dates and are suitable for framing. . . . I am framing the new covers with the comment taken from the magazine as a title to the picture. These, under glass, will be a valuable asset in the studies of industrial subjects." — *L. H.*

THIS MONTH'S COVER

Our cover picture shows two timbermen armed with a double-handled crosscut saw cutting down yellow pine in the Kootenai National Forest, Montana.

Photo by K. D. Swan, courtesy U. S. Forest Service.

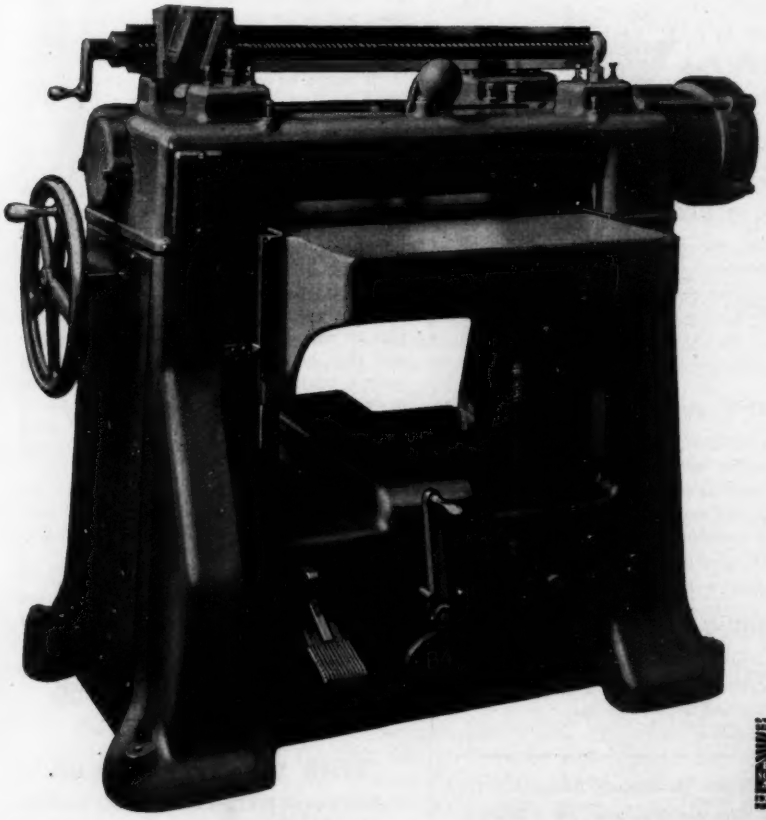
SAFETY...

the primary factor...

VOCATIONAL instructors are immediately attracted by the safety features, the well proportioned lines, the clean cut appearance of the B-4 Single Surfacer. And what is most gratifying to those who use this surfacer is to find within its beautiful exterior the stamina to withstand the hardest kind of usage.

Nothing has been sacrificed to make the B-4 a truly high grade surfacer in every respect. Safety has been one of the principal objectives of the designer; every moving part is fully enclosed so there is no chance for the inexperienced operator to be endangered by either belts or gears.

YATES-AMERICAN is proud to make this contribution to the training of students in vocational woodworking. The B-4 will fulfill its work in the school in the same efficient manner it does in industrial plants.



B-4

- *Totally Enclosed*
- *No Projecting Parts*
- *Direct Motor Drive*
- *Push Button Control*
- *Concentric Chipbreaker*
- *Driven Feed Rolls*
- *Two Feed Speeds Shifted by Lever*
- *One-Piece Frame*
- *Easily Adjusted*
- *SAFE!*

BRUCES SCHOOL SHOP ANNUAL 1932 EDITION

YATES-AMERICAN

YATES-AMERICAN MACHINE COMPANY

Vocational Division

BELOIT, WISCONSIN, U. S. A.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

VOLUME 21 MAY, 1932 NUMBER 5

Industrial-Arts Departmental Supplies, Maintenance, and Equipment, Planning and Accounting

*Roy R. Van Duzee**

A LARGE part of the tax dollar collected in any community goes for the building and equipping of schools, supplying materials used in instruction, and providing salaries for maintenance workers and teachers. Persons responsible for the expenditure of the money used for the support of schools should spend this money as wisely as possible so as to eliminate all possible waste and to secure the greatest return for the money outlay. Probably one of the best ways to get value received for money allotted to schools is to budget these funds to the various departments of the school system. The preparation of the tentative budgets on the part of department heads requires careful study of the needs of the department for the period through which the budget runs, be it a year or several years. When the final budget has been set for these departments, the holding to the amounts allotted necessitates further study so that the wisest use will be made of the money available. It is the purpose of this article to set forth considerations that ordinarily confront the person responsible for the preparation and operation of the industrial-arts budget. The method of preparing the budget, its operation and accounting, used in the industrial-arts department of the West Allis Public Schools, forms the basis of these remarks.

Preparation of the Budget

The preparation of the industrial-arts budget to be presented to the board of education is a task that should not be taken lightly, because the success of the period the budget covers depends to some extent upon the amount of money which is available for the work. It falls ordinarily under three headings: (1) Supplies used in instruction; (2) maintenance — repairs, replacements, and installations; (3) equipment.

I. *Supplies*

The preparation of the supply budget should take into account the money appropriated to that purpose over the past budget period, the kinds of activities to be offered, contemplated changes in projects to be made in the courses, and the anticipated enrollments.

II. *Maintenance*

Many school systems do not provide for a separate maintenance item for school shops. Work under this classification is either charged up to the building, or all work of this character is done by the teacher or by the classes. Where there is not too much of this work to be done, and where the teaching load is not too heavy, it may well be worked into the regular classwork. However, when a teacher has a heavy schedule of large classes the better plan is to include a separate item for repairs, replacements, and installation separate from the regular equipment item.

III. *Equipment*

In the early period of shopwork when a series of models were made in a single-activity shop and where the number of students to be taught was commonly set at 24, the equipment needs for a given subject were fairly well standardized. These conceptions of the work are still held by many school administrators and school architects despite the changed and changing objectives of industrial-arts education, its offerings, and the increased number of students to be handled per class and the increased number of classes to be handled per day. It is up to shop teachers, supervisors, and directors of industrial-arts and vocational education to show cause, as it were, for increased size and number of shops and larger money outlay in equipment. Some schools have been accused of overequipping. This is a more serious error than underequipping because reasonable arguments may be advanced for the addition of more equipment if needed, and this handicap is temporary. However, overequipping may cause serious embarrassment to the work for several years. Equipment needs usually fall under two headings; (1) equipment for old buildings and (2) equipment for new buildings. The same basic problems must be met in either of the above cases in order to avoid unsatisfactory results. While excellent lists, such as may be found in *Bruce's School Shop Annual* and the maga-

*Supervisor of Industrial Arts, West Allis, Wisconsin.

zines published for the shop teachers, are available, each equipment problem must be solved in the light of local requirements. A consideration of the following items has been found helpful in determining the kind and amount of equipment for a given shop:

A. *Concerning what the shop is to be equipped for*
   1. Purposes or objectives of the work
      a) Introductory, finding, acquaintance
      b) Prevocational
      c) Technical
      d) Trade
      e) Hobby, recreational
   2. Activity or activities to be taught
      a) Specific operations to be taught
      b) Degree of skills to be expected
      c) Rate of work or amount of work to be done
      d) Size of work
      e) Material to be worked
   3. Grade where taught
      a) Age of student
      b) Size of student
   4. Time allotment
      a) Length of periods
      b) Time per semester

B. *Number of students to be handled*
   1. In a class
   2. Total number of classes to be provided for

C. *Method of teaching, class organization*
   1. Unit shop
   2. General-shop equipment
      a) One unit taught at a time
      b) Several activities taught simultaneously
   3. Amount of equipment assigned to individual students
   4. Storage of individual equipment and unfinished work
      a) Bench space or
      b) Cabinet space
      c) Combination bench and cabinet

D. *Shop space available or planned*
   1. Size and number of rooms
   2. Shape of rooms
   3. Built-in cabinets and accessories
   4. Separate lecture demonstration space

E. *Amount of money to spend*
   1. Immediately
   2. Ultimately

It is obvious that certain types of benches, machine and hand tools which are appropriate for introductory courses are entirely inadequate for technical and trade courses. The tools selected must make it possible to teach all the operations contemplated to the degree of skill required on the material to be used. Large-sized, heavy equipment is inappropriate for the smaller student and probably unnecessary where the time allotment for the use of these expensive machines is not adequate. Where but one or two small classes of students are to be handled in a shop, a different bench equipment is needed than where five or more classes are handled each day. In case several kinds of work are to be taught in a shop at one time, the number of tools in each trade division may be cut down. Each shop should provide facilities for carrying on class discussions and if a seating arrangement is not available some method should be provided in conjunction with the bench equipment for seating students. Whether the money to equip a shop is available immediately or over a period of years, original plans should include all anticipated equipment.

Having completed the lists the next step is to find out what the items will cost. Strange as it may seem, many shop teachers either do not know how to specify their needs or are careless in the preparing of specifications because they frequently do not get the tool they were requesting. If the specifications are correctly and fairly drawn, the right equipment will be received and at a fair price. The requirements should be advertised for bids or sent to competing firms as requested by the board of education. Care should be taken to so word the specifications that competing firms may submit propositions and expect consideration. If a buyer has an item of a certain design and construction and does not intend making comparisons of propositions, he should not lead other firms to think that they have a chance at making a sale.

How to specify needs. In specifying needs, state
   1. Hand tools
      a) Number of items wanted
      b) Name of item
      c) Size
      d) Description

Example: 1 handsaw, crosscut, 22″ straight back, 9-tooth.

   2. Machine tools
      a) Number of tools wanted
      b) Name of tool
      c) Size of tool
      d) Capacity — rate to produce work; speed
      e) Type
      f) Power of tool
         (1) Kind
         (2) Amount
         (3) Drive
         (4) Electrical control
      g) Guards — specify code with which they must comply
      h) Electrical accessories — specify code
      i) F.O.B.
         (1) Factory
         (2) School
      j) Installation — specify if to be installed

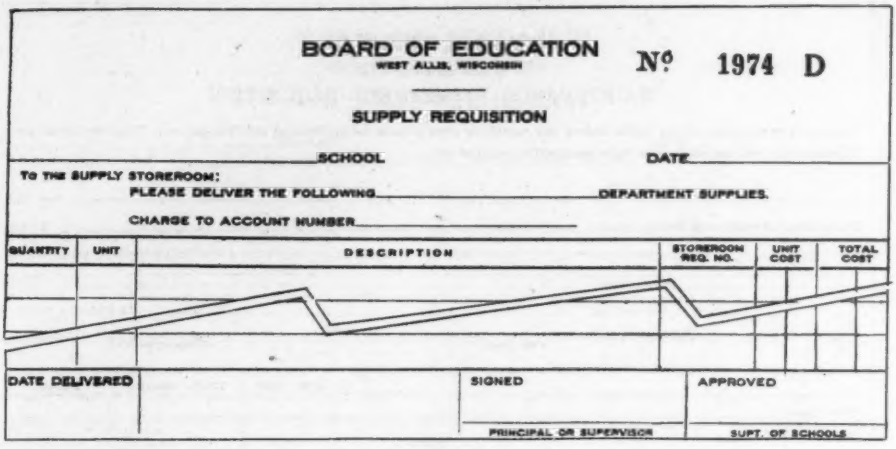
Example: 1 hand jointer, 8″, safety head, 2-h.p. 3-phase, 60-cycle, 220-volt, and motor mounted on arbor, push-button control provided with overload and undervoltage protection, guard to comply with requirements of Wisconsin Industrial Commission, electrical connections and accessories to comply with Wisconsin State Electrical Code, F.O.B. Horace Mann Jr. High School, West Allis, Wisconsin.

   3. Furniture and bench equipment
      a) Size
      b) Drawer arrangement
      c) Description of quality and kind of material, workmanship, construction, design, size of stock, etc.
      d) Type, size, placement, and method of fastening vises
      e) Finish
      f) Submit drawing if a special bench is to be made up

Example: 30 manual-training benches, similar in material, workmanship, construction, and finish to Sheldon No. 6350 with one drawer 21 x 16 x 4″, and 6 drawers 10¾″ wide and 16″ deep, and 7″ high, with six master-keyed locks, one No. 10 vise, no tool racks, with 6″ block in tool well, made to drawings submitted.

After the bids have been received they should be carefully compared, and the tools, machines, and furniture selected which best suit the needs of the work. The complete equipment budget may then be prepared from the

cost of items selected. When the tentative budget which was submitted to the board of education has been passed on and the operating budget returned to the supervisor, it is a good plan to prepare a listing of funds under the several headings of supplies, maintenance, and equipment and give a copy to each teacher with the advice that he may not exceed the funds placed to his account.



BOARD OF EDUCATION
WEST ALLIS, WISCONSIN

No. 1974 D

SUPPLY REQUISITION

SCHOOL _____ DATE _____

TO THE SUPPLY STOREROOM:
PLEASE DELIVER THE FOLLOWING _____ DEPARTMENT SUPPLIES.
CHARGE TO ACCOUNT NUMBER _____

QUANTITY	UNIT	DESCRIPTION	STOREROOM REQ. NO.	UNIT COST	TOTAL COST

DATE DELIVERED		SIGNED	APPROVED
		PRINCIPAL OR SUPERVISOR	SUPT. OF SCHOOLS

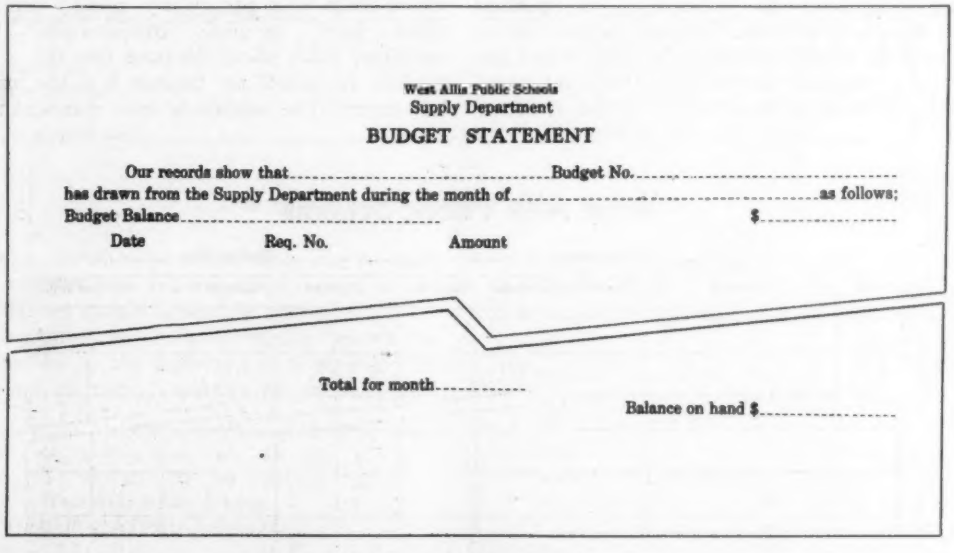
SUPPLY REQUISITION

Operation of the Budget

1. *Supplies*

Supplies may be provided in several ways, among them are: (1) buying locally as needed and delivered to shop; (2) buying supplies for a semester period and delivered to the shop; (3) by establishing a school purchase-and-supply department. Where the school system is large enough, many advantages accrue from the working through the school department. Each shop needs to carry but a small inventory of supplies as deliveries are made on a weekly, biweekly, or monthly basis. The shop teachers save time because they spend a minimum of time in getting supplies needed. The supplies that go into each shop are charged to that shop by the supply department so it is possible to determine accurately the amount of money used by each shop and each teacher.

In the West Allis public schools supplies are secured by filling out a supply requisition from the board-of-education standard supply list. The requisition is countersigned and approved and then sent to the supply department. Deliveries are made weekly. The items are priced by the supply department. One copy of the requisition then is retained by the supply department, one copy accompanies the goods and is left with the teacher, and one copy goes to the supervisor.



West Allis Public Schools
Supply Department

BUDGET STATEMENT

Our records show that _____ Budget No. _____
has drawn from the Supply Department during the month of _____ as follows;
Budget Balance _____ $ _____

Date	Req. No.	Amount

Total for month _____

Balance on hand $ _____

BUDGET STATEMENT

The record kept in the supply department shows the amount of money used in each shop and by each teacher. At the end of the month a budget statement is sent to the supervisor which shows a summary of supplies used throughout the department.

2. Repairs, maintenance and installation

Requests to have repairs made to equipment, changes made in shop arrangements, trucking service and the installation of machines, benches, racks and like equipment are made on maintenance-department requisitions. Since these requests involve changes in equipment or buildings they must be signed by the principal of the building, where the work is to be done. Complete instructions including drawings must accompany the form. When the work has been completed the cost of the work and materials is deducted from the departmental budget. A charge is made against the shop and a record is sent to the supervisor showing that the deduction was made. In this school system, tools bought for replacement are not bought by the supply-and-maintenance department.

BOARD OF EDUCATION
WEST ALLIS, WIS.
MAINTENANCE DEPARTMENT REQUISITION

When work or equipment of any kind is desired, this requisition must be made out by Principal and Principal only. When the Maintenance Department gets the approval of the Board same will be complied with.

_____ School Date _____

Please have following work done _____

Signed _____ Approved _____
PRINCIPAL SUPERINTENDENT

	UNIT COST	TOTAL CHARGE	BUDGET
Time Spent			
Materials Used			

When work is completed have principal sign.

PRINCIPAL DATE WORKMAN

WORK REQUISITION

3. Equipment

Equipment purchases are made by the supervisor direct through the board of education on a purchase requisition. The tools bought are arrived at through the consideration of the various bids and propositions submitted by competing companies by a committee consisting of teachers who use the kind of tools being bought. A great deal of money may be saved if the points suggested under preparation of the equipment budget are carefully considered. The type of machinery to be bought for school shops is a particularly mooted question. What about light, portable, comparatively inexpensive machines? What about the point that this is the proper machine for school use because it is the machine used in industry? The solution to these questions may be answered by saying that each type and size of machine has particular usefulness according to what is required of it as to the purpose of the work, work it will do, how long it will last, and the ease of keeping it in operation under school conditions it is to operate under. Of course the available funds are an important factor. The writer has seen installations of machines so large that the teacher was the only person who could safely operate the

West Allis Public Schools

Year _____ Department _____ Budget No. _____

Date	Company	For What Expended	Req. No.	Balance	Amount Req.	Am't. of Bills

WEST ALLIS PUBLIC SCHOOL ACCOUNT

machines. He has observed 36″ band saws in shops where a $30 jig saw would do 95 per cent of the curved sawing done in the shop. Certain other machines which are excellent when handled by workmen in industry are difficult to keep in operation in school shops due to their design and construction. To adequately equip at the lowest possible cost entails exhaustive study.

Since the equipment is purchased directly through the board of education by the supervisor, it is necessary to keep an account of money expended for the materials. This is done on the budget form (p. 145 and 149) which permits of a balance being shown after each purchase. A record by shops is kept of equipment purchases as is done for supplies and maintenance.

BOARD OF EDUCATION
WEST ALLIS, WISCONSIN ORIGINAL
PURCHASE REQUISITION

_____SCHOOL DATE_____
PLEASE ORDER MATERIAL AS SPECIFIED BELOW

ORDER OF_____ PUR. ORD NO._____
LOCATED AT_____ DATE ORDERED_____
MUST BE SHIPPED ON OR BEFORE_____ON AND NOT BEFORE_____ MUST BE HERE BY_____
SHIP TO_____ SHIP VIA_____
SHIPPING ADDRESS_____ BOUGHT F. O. B._____
FOR_____ DEPT. ORDER NO._____
_____ PREVIOUS P. O. NO._____
SHIPMENT PROMISED_____ SHIPPED_____ DELIVER TO_____

QUANTITY	KIND OF MATERIAL	ARTICLE		

PRICE TERMS DELIVERY

SPECIAL REMARKS_____

IN STOCK AND ON ORDER, INCLUDING THE ABOVE_____ ISSUED BY_____
USED IN THE LAST 4 MONTHS_____ SIGNED BY_____
APPROVED_____
APPROVED_____
TO BE SOLD TO PUPILS_____ APPROVED_____

MAINTENANCE DEPARTMENT PURCHASE REQUISITION

0 0 0 0 0 0 0 0 0 0
10 10 10 10 10 10 10 10 10 10

West Allis Public Schools
SHOP-MATERIAL CARD

Name ..... H. R.....
Subject..... Grade.....
Amount of Deposit.....
Deposit Rec'd..... .....
Materials Used ....
Refund ....
Shop Teacher..... Date.....

1 1 1 1 1 1 1 1 1 1
0 0 0 0 0 0 0 0 0 0

SHOP-MATERIAL CARD

Shop Record and Accounting

1. Shop collections.

It is necessary that some plan be used to collect fees

(5) (25) (5) (3) (3) (1) (1) (1) (3) (3) (3) (3) (25) (5)
(1) (1) (2) (3) (3) (3) (5) (5) (5)

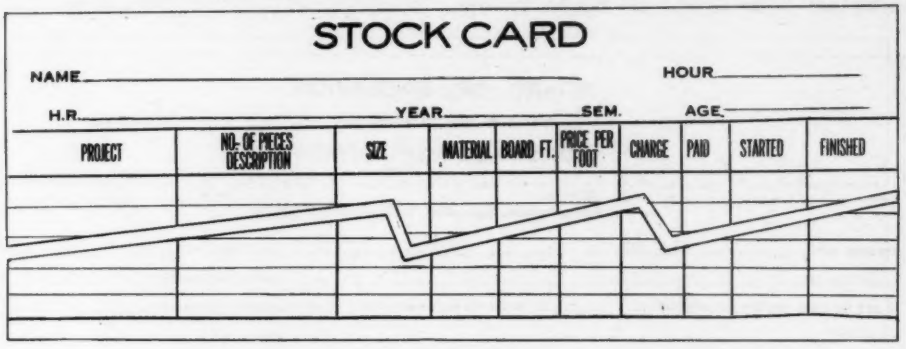
Name..... H. R.....
Grade..... Locker..... Hour.....
Job ..... Job .....
1. ..... 5. .....
2. ..... 6. .....
3. ..... 7. .....
4. ..... 8. .....

Money Paid in
5 5 5 5 5 5 10 10 25 25 25 25 50 50

(25) (5) (3) (2) (2) (1) (1) (5) (10) (10) (5) (25)
(1) (1) (1) (3) (3) (3) (3) (5) (5) (5)

RECEIPT CARD

or the money that is paid for materials used. Some schools furnish supplies for students who are enrolled in required courses and make charges in elective courses according to the amount of stock used. The practice in West Allis is to charge a flat fee for required work and to require payment for material used in the elective classes. Mechanical-drawing supplies exclusive of blueprinting materials are bought from the bookstore which is maintained in each school.

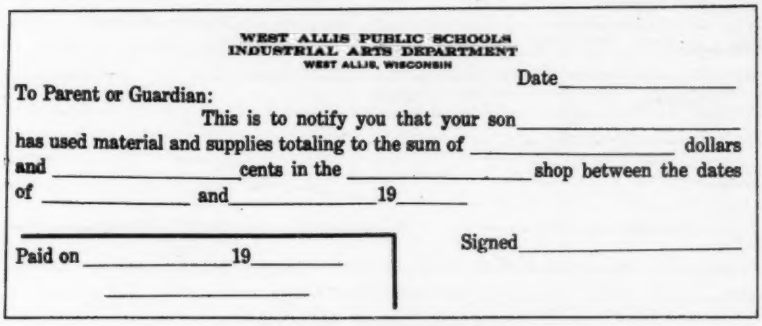

STOCK CARD

NAME_____ HOUR_____

H.R._____ YEAR_____ SEM. AGE_____

PROJECT	NO. OF PIECES DESCRIPTION	SIZE	MATERIAL	BOARD FT.	PRICE PER FOOT	CHARGE	PAID	STARTED	FINISHED

STOCK CARD


WEST ALLIS PUBLIC SCHOOLS
INDUSTRIAL ARTS DEPARTMENT
WEST ALLIS, WISCONSIN

Date_____

To Parent or Guardian:

This is to notify you that your son_____ has used material and supplies totaling to the sum of _____ dollars and _____ cents in the _____ shop between the dates of _____ and _____ 19____

Signed_____

Paid on _____ 19____

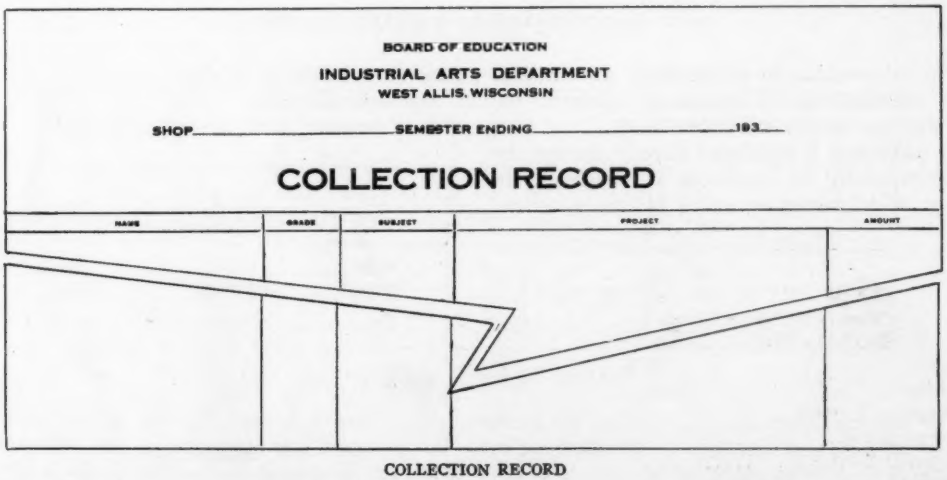
_____

PARENTS' NOTIFICATION CARD

Some schools furnish supplies for students who are enrolled in required courses and make charges in elective courses dents to buy a shop-materials card at the school bank works well in some schools. The amount of stock used is punched out on the cards. When the card is used up another one must be secured. Money not used is refunded when the card is properly signed by the shop teacher.

Some situations require the accepting of money in small amounts. The receipt card shown on page 147 permits the use of this plan.

Where large projects of individual character are made, the stock card provides an excellent means of keeping a record. This card, followed by a notice to the parent that the student has used certain materials, furnishes evidence of the need for the money. The setting down of the bill of material and its costs to show the estimated


BOARD OF EDUCATION
INDUSTRIAL ARTS DEPARTMENT
WEST ALLIS, WISCONSIN

SHOP_____ SEMESTER ENDING_____ 193__

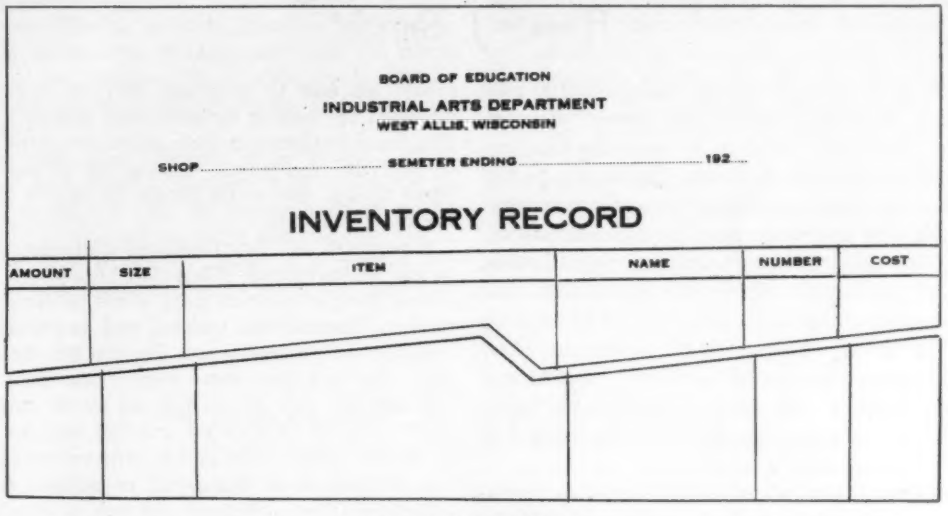
COLLECTION RECORD

NAME	GRADE	SUBJECT	PROJECT	AMOUNT

COLLECTION RECORD

The question of how best to handle shop collections is a difficult one to answer. A plan that works well is to permit the shop teacher to use any method that will secure collections, provided a uniform scheme of reporting collections to the supervisor is used. Requiring stu-

cost of the finished article is a good plan as it saves disappointment later. A different type of project may be selected if the cost is thought to be too great. In every case a student should receive a receipt for money paid the teacher.



BOARD OF EDUCATION
INDUSTRIAL ARTS DEPARTMENT
WEST ALLIS, WISCONSIN

SHOP..... SEMETER ENDING..... 192....

INVENTORY RECORD

AMOUNT	SIZE	ITEM	NAME	NUMBER	COST

INVENTORY RECORD

Teachers report collections on the collection record. A separate record is made out for each class and shows *all* students who have been enrolled in the class for the semester, what the money was paid for and the amount paid by each student. If no money was paid by a student the record shows the amount he owes and why it was not paid. The two reasons are: (1) when a student is on the indigent list: (2) when the money is uncollectible. A very small amount of money is uncollectible if shop fees are collected at the beginning of the semester in required courses and if no material is used in elective courses beyond a limited amount. More stock is issued when the stock already withdrawn has been paid for. It is inadvisable to make collections through the principal's office except in unusual cases. These are very infrequent if collections are properly handled. A report is made to the board of education showing a summary of the collections by teachers for the department, and indicating that records are on file in the supervisor's office showing the collections made by teachers and classes, from students and other persons. These records are audited by the board-of-education auditor.

2. Inventories

In order to keep a proper record of tools that are in school shops, an inventory of tools should be made at least once a year. This record should be made from a careful physical check of the tools. Such records are valuable in cases of losses due to theft of tools during the school year or the summer vacation and for replacement in case of a fire. The use of a loan slip is invaluable in keeping track of tools. A good rule is never loan a tool to a student. Get responsible persons to sign loan slips; that is, if a tool is to be loaned for a class play have the sponsor of the play sign for the tool, not the student.

Conclusion

An industrial-arts department should be run on a business basis. This implies that some plan must be made for expenditures of money allotted to the department and money collected from the students. The preparation of a budget encourages teachers to think through their needs and to get the most for their money. The placing of money in specific accounts by shops and teachers eliminates unnecessary expenditures and is a valuable means of regulating pupil instruction costs. A lump sum spent for supplies in a department does not provide the means of determining excessive expenditures. It is necessary to show records of specific shops. The most accurate means possible should be used in recording money received and transmitted to accountable persons. This insures the minimum of confusion in handling school money.

Board Of Education
West Allis, Wis.

Date _____

To _____ *Budget No.* _____

Your budget has been charged in the amount of _____

For _____

_____

Maintenance & Supply Dept.

TEACHER'S BUDGET STATEMENT

High School
West Allis, Wis.

Date .....
Time .....

RETURN CHECK

I have received today in good condition from the .....Department the following:

.....

which I agree to return within.....hours. If lost or broken, I agree to replace same to the satisfaction of the Department

Please call for this slip when article is returned

.....
Sign here

RETURN CHECK

Judicious Conformance

*Homer J. Smith**

SOME of us who are concerned with industrial and similarly practical subjects may resent the suggestion that we should strive to be more like teachers in the general and academic fields. There may be the feeling that our work is inherently and unalterably different; that for us to remain *unlike* is the surest way to fortify our gains in acceptance and respect; that new heights lie always where new paths lead and where new ways obtain. This article is an attempt to show that is is only wisdom to be *similar* and that more rapid progress can be made through discreet and discerning compliance. We need not forsake our chosen ends but may tactfully improve our approaches. A judicious conformance will serve us.

We want new types of schools and classes, more elastic forms of administration, a higher percentage of students to serve, a greater amount of time, and increased physical facilities. We must get these through the official sanctions of men and women trained in the established ways and the current fashions of the schools. Our superiors must be dealt with on ground that to them seems secure, and in language that is theirs. We must follow approved patterns. The preparation of the superintendents and principals, their daily thinking, their plans and ambitions must be reflected in our proposals. There is perhaps no better way to gain their interest and to earn their continuing trust than to conduct the work already in our charge in a manner which they naturally approve. To make things reasonable to them would seem to be a practical policy for us. There is strength in consistence and advancement in harmony.

It will pay us to be prompt and at ease in justification of our departments and of each of the courses within them. If our objectives can be phrased in keeping with those announced for the school or the system they will be more surely recognized. Other teachers think and speak of their subjects in terms of the goals set and of the particular *plan* which, for the time, has place. We must join with the group in relating our content to school and community interests. We must be as adept as our fellows in matching the needs of our students. We must prove equally able and willing to hold down rising costs. These are obligations of all teachers alike.

Our superiors are accustomed to definite and well-organized courses of study, commonly exacting them for all subjects and grades. We must be punctual in meeting this expectancy and may well study the modes of our colleagues in this particular. Certain it is that our courses should be shown in terms of things to be learned, not as lists of things to be made and done. If the items comprising the courses can be ordered to match some scheme of the corps' enthusiasm, our offerings will be more acceptable and we shall be judged in tune. Nor should we wait to have this duty of course planning indicated by those in authority and hounded to completion. Some teachers will delay and some others will hasten to meet the requirement, seeking aid on the parts that prove trying. (Even this asking for help is a technique worthy of comment.)

Supervisors, on their rounds of visitation, may expect to find us instructing. When they step into a room they should have no question as to which of the group is the teacher. Whereabouts, manner, and employment should evidence our profession and disclaim the duties of foreman. The fact that many men of our field are found working like their pupils has led to the suspicion that teaching has not been done and that students are trying at random. The further fact of little variety in procedure has stamped us as unknowing or without appreciation in method. These judgments, too true for comfort, will be reversed only when we appeal to students and present our materials in the different ways that are common in other classrooms. And, just as good method will be to our credit, so will the shipshape work place and routine that is well developed. Good generalship, with its complement in discipline and atmosphere, is always at a premium.

Textbooks and homework will not escape attention; nor will frequent testing and improved systems of grading. The more enlightened superiors will be pleased to find emphasis upon information as contrasted with product. Hesitancy about taking the productive jobs they offer, because disrupting to program and of low learning value, will place some of us in favorable comparison. There is hope to pack the industrial course work with learning experiences comparable to those found elsewhere.

A keen interest in the development of individual students always appeals. If we would raise our rating there must be greater enthusiasm about average and gifted youngsters and less suggestion of boredom with those who are deficient.

It will be appreciated if we exhibit interest in new educational experiments or movements, seeking in each instance to find a parallel or to particularize within our special fields. Initiative is almost universally rewarded, as are loyalty, industry, tact, and coöperative spirit. Sloth, especially where records and reports are involved, is genuinely despised. (Do we match other teachers on the whole, in these respects?)

Credit will be given those who read widely, who submit requests for books and journals, who build margins of subject understanding, and who are not opposed to the new. Freedom of expression in teachers' meetings and participation in regional assemblies are credentials worthy of the effort and practices tending to defeat a prevalent apology for our type of endeavor. Those who desire formal preparation beyond that required for certification will be encouraged. A warmer greeting will be the lot of those who are careful of personal appearance, who eat at good tables, and who go to good places. At convention

*Professor of Industrial Education, University of Minnesota, Minneapolis.

time a membership should be considered wiser purchase than a box of shells or new fishing tackle.

These are common, seemingly needless, suggestions but they expand the *professional* concept. They are probably as important in their way as many other means by which we hope to advance ourselves and our phase of education. Some of them have to do with objectives and offering, others with method and management, and still others with actions and attitudes. All of them imply that we are unlike our fellows in many respects, and this to our disadvantage.

Let it be understood that the writer is proud of the progress we have made in the very matters referred to. We are happy on our way but we are hindered by the unthinking few who are scattered and therefore of influence. We have made our advances through sturdy building on solid bases but must reach our perfection through more adroit means. The sense of this writing is that reasonable compliance with accepted usage will greatly enhance our prestige. It is claimed that industrial teachers can profit by the example of their coworkers. I have called the policy one of judicious conformance. It is urged not alone because it seems wise, but also because it seems right. Procedures developed and standards set in general education, through a long and marvelous history, place much at our disposal. What we can and will accept, will have to do with our future. We have learned from others and they from us to the extent that there has been mutual understanding and somewhat of similarity. Let us continue to create new aims and to devise new plans of attainment. But, let us believe that having new desires does not forbid striving to fulfill them by the most common and accepted means. A judicious conformance will serve us.

School Exhibitions

*C. A. Kunou**

A SCHOOL exhibition should be a display of educational materials, devices, processes, subject matters, methods of presentation, activities, and children's products. A display of work of all departments of the school or of the school system, in which no department outshines other departments in importance of work and practices, is an integrated exhibition. A display of children's products alone may be called a museum exhibit. A display of children's products and the processes involved, and methods of teaching, may be called a moving exhibit, because it exhibits the mechanics of the schoolwork; the way to get at things; the methods and the steps to obtain results. A display of work of one department of the school is individual in character. A school exhibition where, in addition to display, the products of the children are sold, is a fair, or rather a bazaar. The bazaar idea is not new. In some European educational centers, there exist permanent bazaars where children's work is on exhibition and for sale. A school exhibition which, in addition to the display of materials, processes, and procedures, attempts to display the final outcomes of the school activities, is a dioramic exhibition. It attempts to show, for instance, how healthy and clean-lived a pupil will be as an outcome of physical-education activities; how skillful and successful a pupil should be because of industrial arts and guidance; or how altruistic and civically efficient he may become by the realization of citizenship and worthy home-membership aims. A dioramic exhibition then, is a display of things seen *through*. It is a look at the future result of work done in the present. It gives the spectator a glimpse into the land that is promised. This classification and these statements are made for the purpose of showing how a school exhibition may be made to present the right idea of the work of the school and of the school system; and also to show how easily a school exhibition may present a wrong idea of the schoolwork, and be uncertain in its effect on the public. It is with a school exhibit as with a commercial window display; it may be made to entrap the spectator into accepting wares different in reality from those on exhibition in the display window. Teachers and school administrators ought to ask themselves, "What is in our educational display window?" Educators should realize that we are in the midst of the visual as a factor in mass education. School exhibitions will increase public respect and confidence in what is seen in the work displayed. School exhibitions will increase the prestige of education, and of the schools as institutions in the community. School exhibitions will educate the public to understand new methods, and arouse public sentiment in favor of improvements and increased educational facilities. School exhibitions will set educational standards. Teachers, pupils, and patrons see what others do and attain.

The efficacy of school exhibitions to promote the interests of the schools has been much underestimated, and the art of display at school exhibitions deserves more serious study than has been given to it in the past. Many crudely arranged exhibitions, without well-defined purposes, have prejudiced the public; and sentiment against educational activities has been the actual result of some of these exhibitions. School exhibitions should be logical in layout and dignified in arrangement. But there is very little precedent for educators to build upon, and so far as the writer knows, no bibliography directly treating of school exhibits exists.

*Supervisor Manual Education, Los Angeles, California.

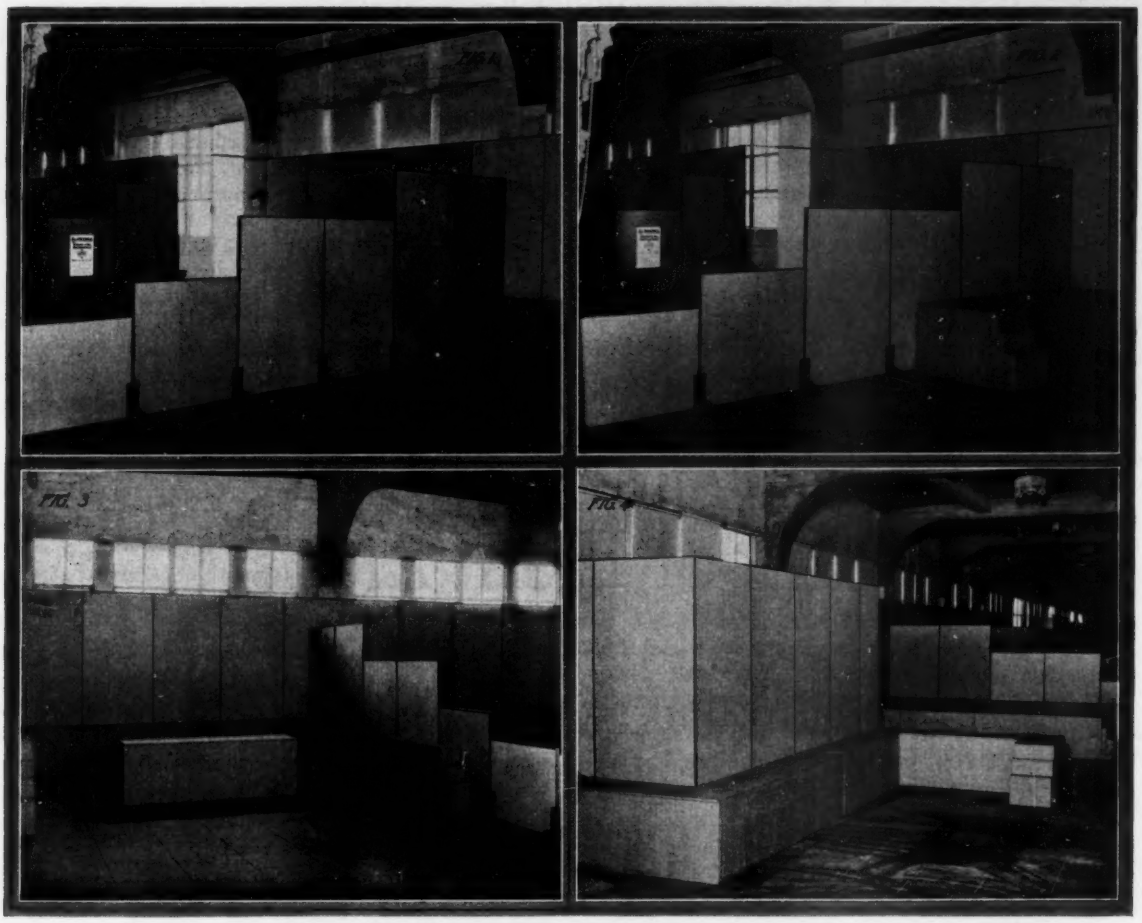
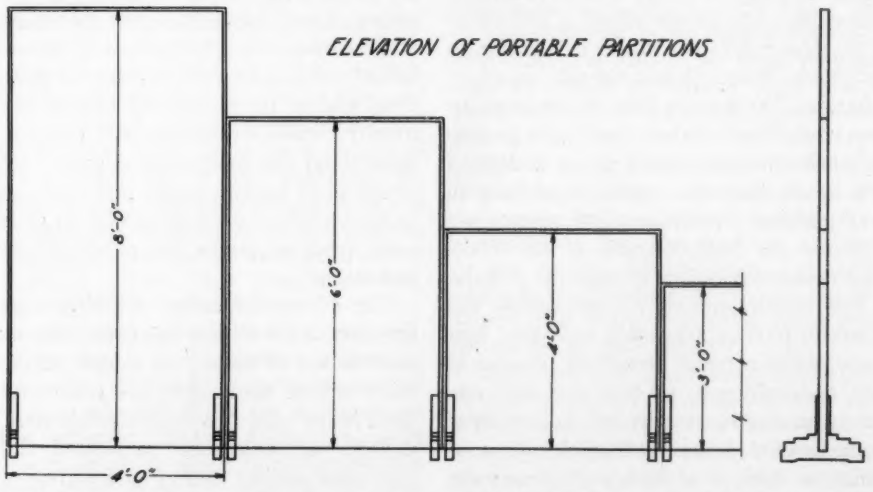


FIG. 1. VIEW OF PARTITION SCREENS IN POSITION AT RIGHT ANGLES TO THE CELOTEX COVERED BACKGROUND. PART OF LEDGE TABLE SHOWN AT RIGHT IN THE PICTURE.
FIG. 2. ANOTHER VIEW OF PARTITION SCREENS WITH TABLES AND SET-BACK STEPS ARRANGED.
FIG. 3. VIEW OF AN ORDERLY ARRANGEMENT OF EXHIBITION PARAPHERNALIA.
FIG. 4. PARTIAL VIEW OF ONE SIDE OF SECTIONS OF EXHIBITION. THE PICTURE SHOWS THE VERTICAL BACKGROUND, AND ALSO AN ORDERLY ARRANGEMENT OF LEDGE TABLE AND SET-BACK STEPS.



Certain principles may guide educators in arranging an exhibit.

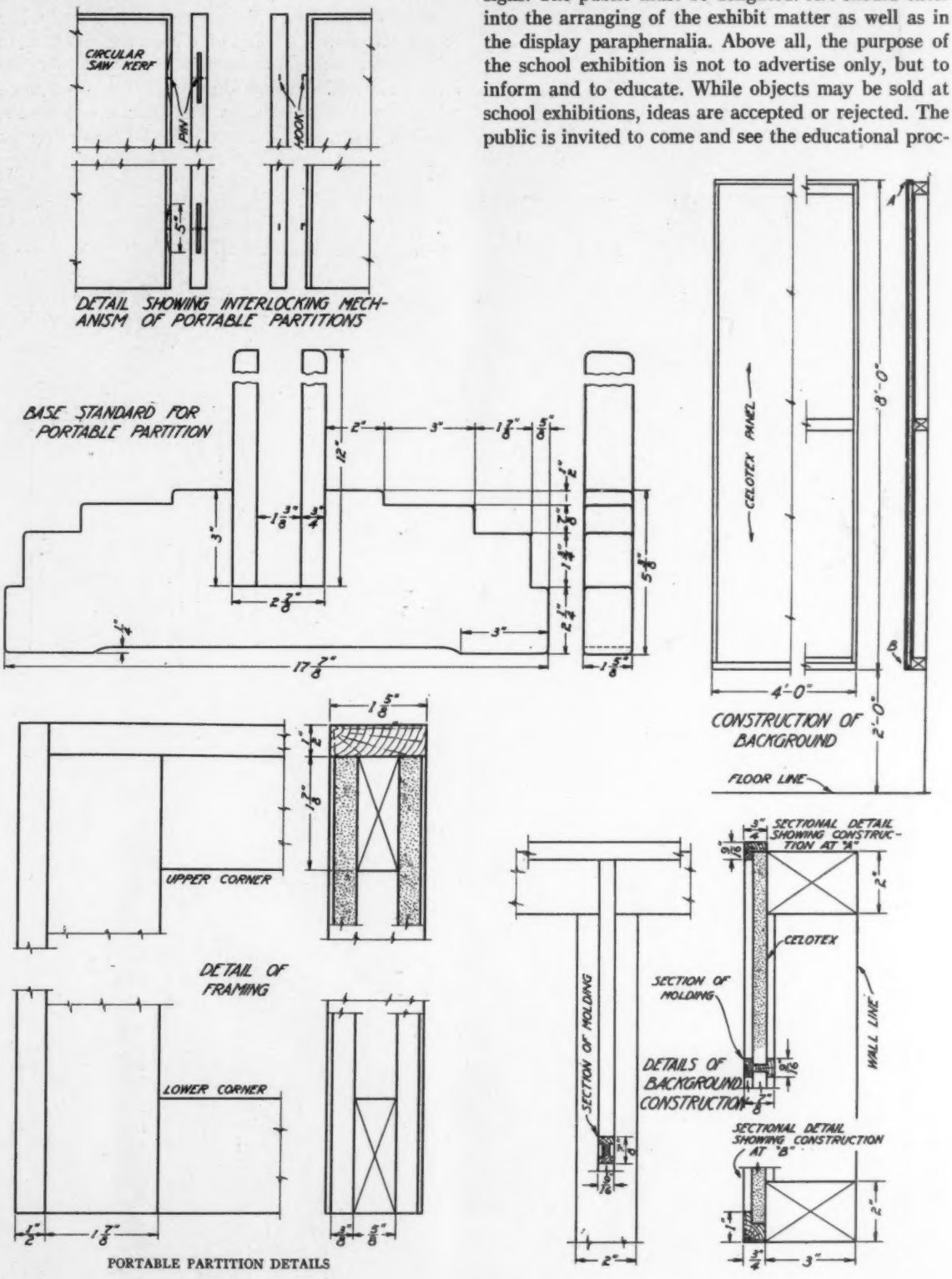
School exhibitions should start out with a well-defined plan of arrangement and of purpose, and should aim at a definite result.

There should be no display of freak activities or theoretical absurdities to establish a wrong concept in the mind of the public.

An exhibition must attract the attention of and please the visitors; it must create confidence in what

is being done in education, and should arouse the sentiment for educational methods and improvements.

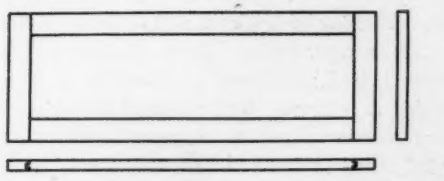
An exhibit must be pleasing and arrest the attention of the visitors. There must be coördination in the exhibit scheme as a whole; and one directing mind to carry out the plan of the exhibit to give it individuality and character. The various parts of the exhibit should be lettered or labeled with dignified and simple signs. The public must be delighted. Art should enter into the arranging of the exhibit matter as well as in the display paraphernalia. Above all, the purpose of the school exhibition is not to advertise only, but to inform and to educate. While objects may be sold at school exhibitions, ideas are accepted or rejected. The public is invited to come and see the educational proc-

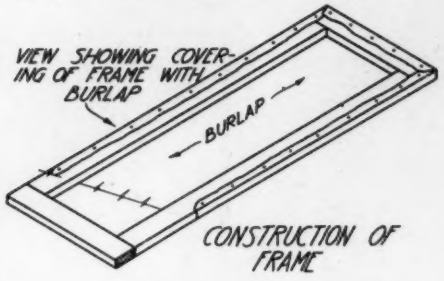


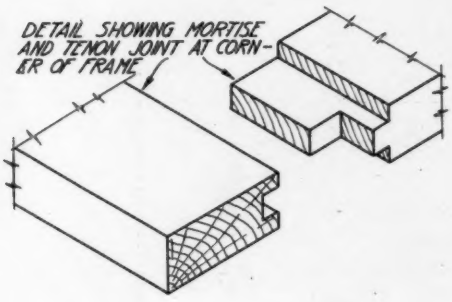
PORTABLE PARTITION DETAILS

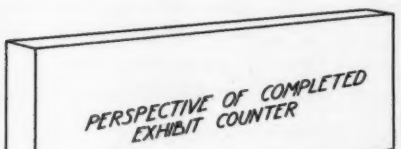
esses through the exhibition. To realize all this, adequate display fixtures are absolutely necessary. It is fundamental to insure a good exhibit and good results.

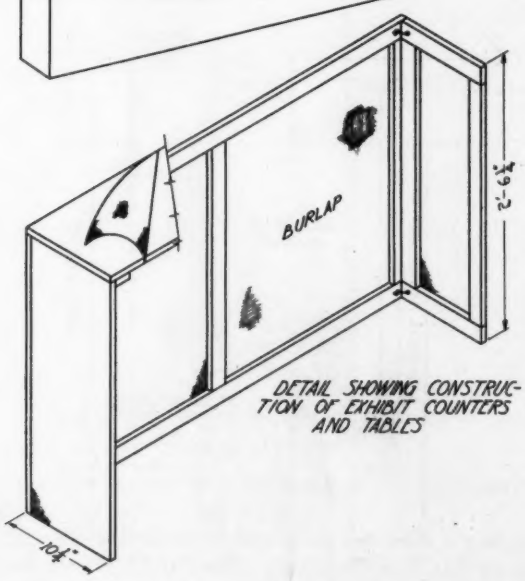
It was the writer's privilege to design and carry out the plan of the paraphernalia for the educational exhibit of the National Education Association at Los Angeles, California. This paraphernalia consisted of partition screens, tables, ledge-tables, and set-back steps. The walls were covered with the same material used for the fixtures. This scheme was so conceived as to compel orderly display of the exhibit matters. In this respect the N.E.A. exhibit at Los Angeles was fairly successful. Further, the paraphernalia was made portable and collapsible, so that after it was used it could be dismantled and stored for future use by the

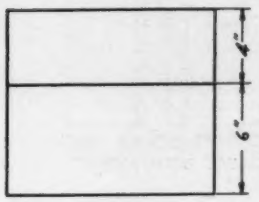


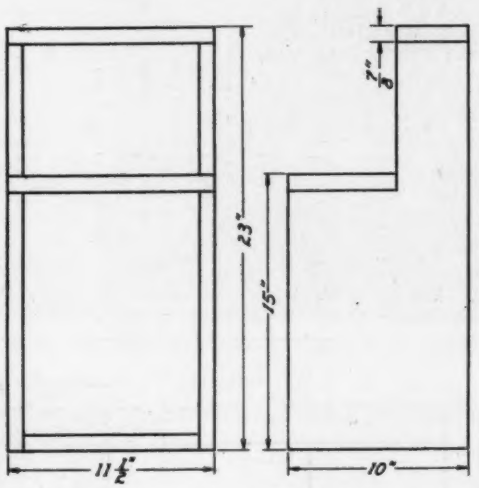


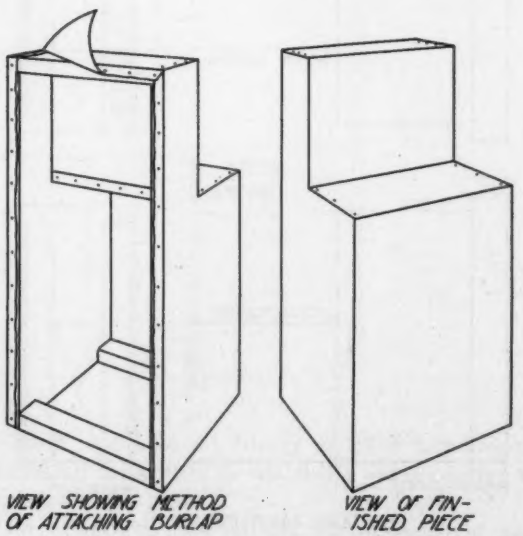












schools for local or general exhibits. The accompanying illustrations and specifications are presented as a practical form of exhibit outfit for schools because there is no doubt that school exhibitions will be more generally used, and because the visual element in mass education is now a world phenomenon.

FIG. 5. VIEW OF SECTION OF EXHIBITION SHOWING DISPLAY MATERIAL FAIRLY WELL ARRANGED ON THE EXHIBIT PARAPHERNALIA

FIG. 6. VIEW OF DIORAMIC EXHIBITION SHOWING THE OUTCOMES OF THE PROFITABLE USE OF LEISURE TIME — ONE OBJECTIVE OF EDUCATION

Figure 6 of the dioramic exhibition reveals that this exhibit had overelaborated fixtures. The center of attraction seemed to be in the fixtures, or rather, the elaborate fixtures detracted from the educational materials on display. The exhibit materials were arranged in booths, and a booth devoted entirely to the illustration of each of the generally accepted aims of education, such as worthy home membership, health, vocation, the proper use of leisure, etc. This exhibit was put up by the Los Angeles city school system a few years ago. It was one of the most complete school exhibitions of its time. It was provided with an elaborate lighting system for evening display.

In contrast with this, is the N.E.A. school exhibit at Los Angeles. The pictures show the simplicity of display fixtures which permitted exhibit matter to stand out in orderly attractiveness.

Specification of Materials

Burlap: natural, 36-in., 8-oz.	$0.14 per yd.
Celotex: natural, 3/8-in.	.033 per sq. ft.
Lumber: white Philippine hardwood, 2-in.	.075 per ft.
Hooks: No. 912 bright wire (Calif. Hdwr. Co.)	2.50 per gross
Nails: cigar-box, 3/4-in., No. 18, sharp point	.104 per lb.
Acme corrugated steel fasteners, 1/2 No. 6 — 1 3/16 in.	1.50 per M.
Nails: 4d finish, 15-gauge	1.45 per lb.
Nails: 8d standard wire, 10 1/4-gauge	.50 per lb.
Nails: 12d standard wire, 9-gauge	.35 per lb.

(Prices listed are Pacific market quotations for schools.)

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Window Display for Profit, by William Harrall Leahy.
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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

NEEDED COOPERATION

Many cities already have adopted the sane method of getting all interested parties to work coöperatively at solving the problems of vocational education. How best to prepare the future workman is a question that should not only interest the school, but it should be of equal interest to the employer and the workman as well.

Upon the right kind of vocational education depends not only the future welfare of the worker, but the welfare and progress of the country. Ill-trained workers cannot graduate into the ranks of efficient foremen, forceful superintendents, far-sighted executives, and yet a large proportion of our industrial and business executives must of necessity come up from the ranks.

The employer naturally is anxious to get workers who are properly trained to carry on the work that is expected of them. Such workers help to cut down costs, to increase production, and to swell the sum total of intelligent consumption. The school, once having assumed the position that the training of the worker lies within its domain, is anxious to fulfill its duties efficiently and well. However, these three interested parties must work together if the best results are to be obtained. The school may be eager to train properly, and it may be fully equipped to efficiently take care of this problem, but industry which needs the worker, must not forget that in order to get a product that fits its need, it too, must learn how to specify definitely what it wants.

Just as any consumer must clearly state in unmistakable terms what he wants before any manufacturer can fulfill his requirements, so the employer must definitely state what is required to fulfill his demands when he wants workers.

With the ever-changing conditions, the requirements of industry are continually varying, and it is therefore necessary that school officials and employers should be continually in close touch so that necessary alterations in the training program may be made in order that it always may take care of the needs of the moment.

The individual worker, as well as labor collectively, is interested in the training of the worker. They therefore must be represented when it comes to decide just how the worker should be trained.

If all of the foregoing is true when the training of the new worker is discussed, it is no less true when the retraining of the worker who has been thrown out of employment due to technological changes, is studied and calmly considered. The human being cannot be cast aside with the complacent ease with which obsolete machinery can be removed and junked. We of the present age feel quite proud of how we have injected humane methods into the handling of our animals, our prisoners, our mentally infirm, our sick, our orphans, and our poverty-stricken, but up to date we have not done as much as we ought in the solution of the problem of what to do with those whom we heartlessly throw out of employment because the trade for which they had been trained ceases to exist, or because they themselves have reached an age which will probably make them unfit to carry on their work at the highest efficiency.

The present depression has drastically emphasized the shortcomings of our industrial-economic life. The solution of the many problems that have been uncovered during this period cannot be expected to be easily found. It may be a simple matter to blame city, state, and federal officials with failing in their duty when they cannot supply a quick method of solving these troublesome questions, but the fact remains that it is a problem which needs the coöperation of the self-same bodies, who must coöperate in the training of the young worker; namely, the employer, the worker, and the school.

If the beginners are to replace the technologically unemployed and the workers of advancing years, these latter must be retrained for something that will help them carry on and still continue to live a life that is worthy of a human being. Adult education is making progress, but much more can still be done. Some cities have already started to open their school shops during the summer months to men who are out of work. There are many other cities where this might be done. The benefits accruing from such a practice are many. Not only is school property used more efficiently, but to the ambitious, who, without any fault of their own, have become jobless, new horizons have been disclosed. For those who attend such classes, life need no longer be without an aim. Each student knows that until normal conditions again prevail, he has a worth-while goal for which he can strive.

Evening schools for the adult are fine — full-time day and vacation schools are a logical extension of the original plan.

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THE TEACHER AND HIS REQUISITIONS

Throughout the school year the teacher has to write out requisitions for supplies and materials. These are usually not difficult to write, as the items required are simple and easily obtainable. At times, however, and this is increasingly true as the end of the school year approaches, the rather important duty of determining what part of the equipment needs replacement, falls upon the teacher.

Writing out requisitions for items of this kind is a much more troublesome job. It must be taken care of, however; and while the supervisor in many cases assumes the responsibility of doing the requisitioning for the teacher, nevertheless the need for the requisitions arises in the school shop.

Both teacher and supervisor, therefore, will be especially interested in reading Mr. Van Duzee's article on "Industrial-Arts Departmental Supplies, Maintenance, and Equipment, Planning and Accounting" which appears on page 143 of this issue.

Writing out requisitions is not something which is definitely relegated to a certain time of the year in any school system. Major items of equipment, small tools, as well as materials and supplies, are needed at various times throughout the year, and the information contained in the article just referred to will be quite helpful to those confronted with the necessity of taking care of the important job of requisitioning.

Both teacher and supervisor should not forget that the advertisers in INDUSTRIAL ARTS AND VOCATIONAL EDUCATION are attempting the year round to keep their products before them through the advertising pages of this magazine. When writing out requisitions, therefore, these advertising pages should be used for reference. They will assist wonderfully in choosing just what is needed. Furthermore, they assist in writing requisitions in such a manner that not only will the writer know what he wants, but he will actually get it.

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HO! FOR SUMMER SCHOOL

Vacation is not far away. The question of what to do with it for many at least is not difficult to answer. Much as additional income may be desired or even required, the absence of opportunity to find placement in industry during the coming summer makes it that much easier to decide right now to enroll for a summer session at some good teacher-training institution.

Those who have become habituated to this manner of spending their summers are looking forward with anticipation to the opening of the summer session. They know from past experience that their attendance at summer school, though coupled with strenuous work, is yet mixed with a great deal of real enjoyment. Old friendships are renewed, new ones made. Familiar haunts about which cluster memories of past good times are revisited, but above all, there is the realization that one is preparing to more efficiently solve the many problems that arise in the classroom during the regular school year.

Then too, those who attend summer school know that each summer session brings them one step nearer to the coveted degree, be that a bachelors, a masters, or a doctors. More and more are shop teachers acquiring the professional spirit which prompts them to prepare themselves for their life's work in an adequate manner. The standards required of the shop teacher, and as a matter of fact, for anyone in the teaching profession, are continually being raised. It is time now to prepare so that the future will hold no regrets. Standards attained will never unfit anyone for a position for which these standards have been set.

Now is the time for the shop teacher to make up his mind. Summer school is beckoning. Heed the call.

TAKING ADVANTAGE OF OPPORTUNITIES

Commerce, industry, and agriculture have for a goodly number of years made use of school facilities in training their new and continuing the training of their older workers. Not so generally have those engaged in civic undertakings taken advantage of school facilities in training the beginner. Naturally large bodies, such as our Army and Navy, have found it necessary to establish their own training institutions to prepare those who enter their ranks, but there are many smaller civic units that require trained or semi-trained help which have depended upon accidental or haphazard measures in the training of their workers, to the detriment of the service.

However, this situation is gradually changing and the past few years show an increasing number of such bodies as city firemen, policemen, school janitors and firemen, superintendents of public buildings, and other workers occupying positions in public life availing themselves of existing school facilities in giving definite vocational training to their new workers.

For much of this work the country is indebted to the painstaking work of the members of the Federal Board for Vocational Education. It is to these far-sighted men that a special vote of thanks is due for the development of courses which make such worthwhile training possible.

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PERSEVERING TO THE END

The close of the school year is again approaching. As a matter of fact, for some it has already arrived. The end of the school year brings with it a great many duties, not all of which are pleasant. Then too, a large number of these duties necessarily cannot be taken care of until the very last week, all of which makes careful planning exceedingly necessary if the jobs are to be properly performed.

Especially irksome are these duties apt to be for the teacher who knows that the end of the school year also marks the end of his services at a certain school. It is of utmost importance, however, that he does not slight even the most minute detail of these final duties, because he owes it to himself that he does not leave any evidences of carelessness, mismanagement, or inefficiency to mar his record and his future reputation.

For this reason it is well to check closely whether all of the following items have been attended to.

1. Cleaning up the shop.
2. Preparing the inventory.
3. Ordering replacements or new equipment.
4. Ordering repairs or alterations.
5. Protecting the machinery against rust.
6. Ordering necessary materials and supplies.
7. Protecting small tools against loss or theft.
8. Post a new outline of instruction.
9. Arrange all lesson material in an orderly manner.

Vocational Agriculture in Rural High Schools

*L. M. Roehl**

FARM-SHOP work can be carried on more successfully in a separate building than in a room in the high-school building. The shop plan accompanying this article is of a building 30 ft. wide by 66 ft. long, which is planned as a shop and classroom. It will be noticed that a basement is placed under the classroom end for a furnace and storage room. The structure, as planned, provides a working unit complete in itself, and the shop, as planned, in some measure resembles a blacksmith and general repair shop. Work on machinery and tractors can be done without interfering with other classes in the school. The metal-working end of the shop has a concrete floor for work at the forge and with tractors and machinery. The benches are not fastened to the floor and may be moved to the sides of the shop when the building is to be used for fairs or exhibits. The 9-ft. door permits passage of farm machinery and large farm appliances. The double rolling door between the shop and classroom allows each room to be used separately, and as one for exhibits and fairs. Sufficient windows have been placed on both sides of the shop to throw light to any point in the shop and artificial light is distributed so that evening short-unit courses in tractor overhauling, farm-machinery repairing, tool fitting, etc., may be carried on. The shop set-up should be such that the farmers of the community will feel at home when visiting in their working clothes at any time.

Objectives

I. *Carpentry and Farm Structures*

1. To perform all the carpentry tool operations in a workmanlike manner and to apply them to such farm repair and construction work as farmers find it profitable to do.

2. To know lumber well enough to make such a selection for any farm need as is made by the carpenters of the community.

3. To make out a bill and figure the cost of construction jobs.

4. To fit handles in farm tools, namely, hammers, sledges, axes, forks, shovels, etc.

5. To know enough about builders' hardware, such as nails, screws, bolts, hinges, rivets, door fastenings, etc., to make a wise selection for any purpose.

6. To be able to cut glass to size and knead putty and properly place a window pane.

7. To know the common kinds and sizes of doors and windows and how to keep them in good working condition.

8. To know the roof coverings commonly used and how to repair a roof.

II. *Painting and Paint Brushes*

1. To be able to clean and care for paint brushes.

2. To properly prepare an interior and exterior surface for painting or varnishing.

3. To know how to choose paint for a particular purpose and apply it to buildings, farm vehicles, machinery, and portable appliances.

4. To know how to repair and refinish a piece of household furniture.

III. *Metal Working*

1. To fit the farm saws (including the circular cordwood or buzz saw if it is used in the community).

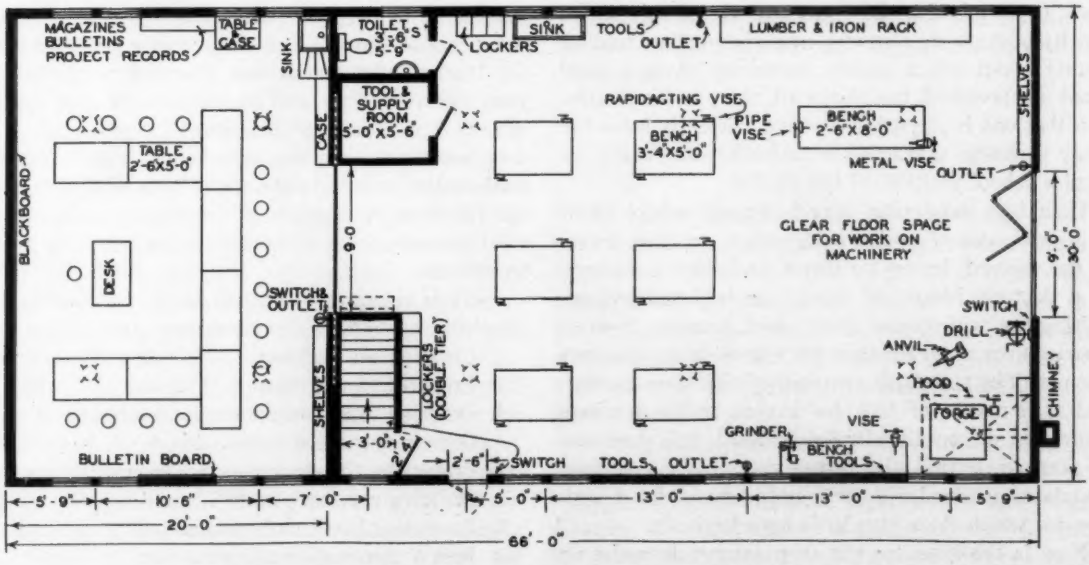
2. To solder, rivet, or otherwise repair utensils used on farms, such as milk cans, pails, etc.

3. To use hack saw, files, cold chisels, punches, metal drills, taps and dies and other hand tools in a workmanlike manner in overhauling farm machinery and keeping other farm equipment in good condition.

4. To grind all edge tools used in farming.

5. To know how to build and keep a good fire in a forge

*Supervisor farm-shop work, Cornell University, Ithaca, New York.



FARM SHOP AND CLASSROOM FOR DEPARTMENT OF VOCATIONAL AGRICULTURE

and properly shape and temper farm tools, such as pickax, mattock, grub hoe, cold chisels, punches, harrow teeth, etc., and to do such other elementary forge work as may be useful in overhauling farm machinery.

IV. *Harness Repairing*

1. To clean and oil a harness.
2. To be able to make harness thread and do stitching.
3. To do all the ordinary repair jobs, such as putting in a new hame staple and hame clip and putting on all ready-made repair parts.
4. To be able to fit or adjust a harness to a horse.

V. *Ropework*

1. To be able to splice a hay rope.
2. To be able to make a rope halter.
3. To reeve a set of block and tackle and figure the mechanical advantages of single, double, and triple blocks.
4. To be able to tie the common knots and hitches which farmers find useful and apply them to farm use.
5. To know kinds of rope suited to farm use and sizes desirable for specific purposes.
6. To know several ways of finishing ends of rope.
7. To know how to care for rope and replace a broken strand.

VI. *Concrete Work*

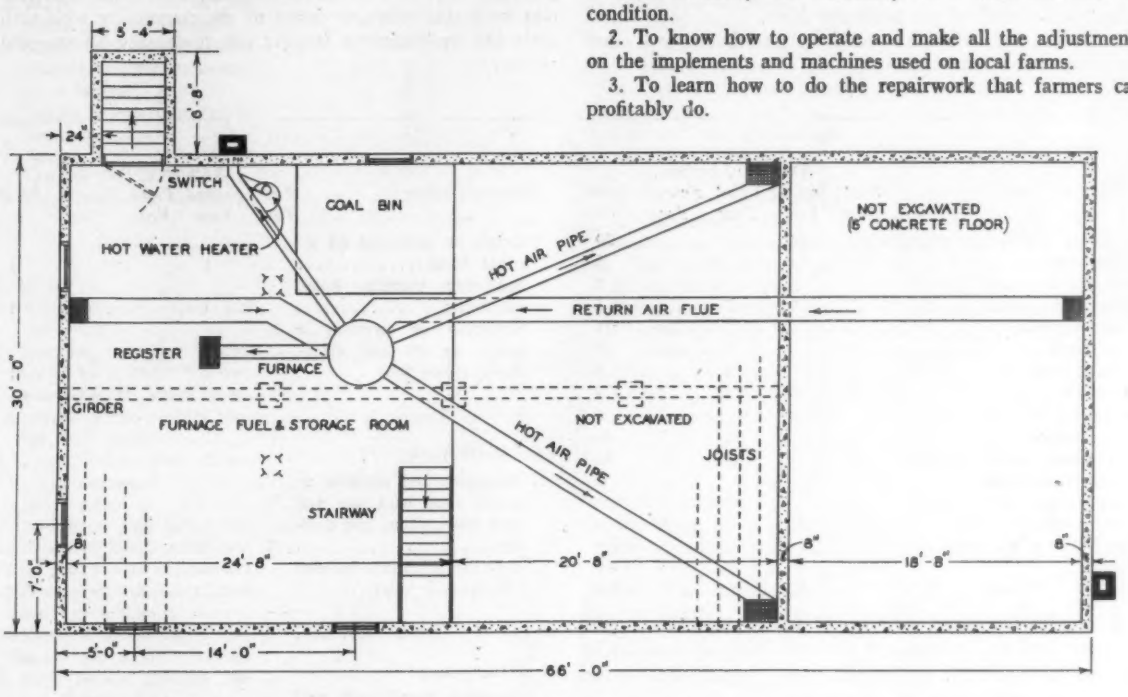
1. To know how to build forms for walls, floors, mangers, walks, curbs, milk houses, etc.
2. To test gravel and sand for cleanliness and know mixtures suited to particular purposes.
3. To be able to mix, pour, and trowel a construction job in a workmanlike manner.
4. To do a repair job in concrete.

VII. *Agricultural Drawing*

1. To be able to read such drawings as pertain to rural life.
2. To be able to make working drawings of such appliances as farmers find it profitable to make.
3. To be able to make free-hand sketches of details of construction.
4. To be able to make rough drawings of floor plans of farm buildings so as to make clear to carpenters, contractors, or architects what is desired.
5. To arrange and draw to scale the layout of farm buildings and fields so as to provide economic use of labor.

VIII. *Field Machinery*

1. To inventory the machinery on a farm and find its condition.
2. To know how to operate and make all the adjustments on the implements and machines used on local farms.
3. To learn how to do the repairwork that farmers can profitably do.



BASEMENT AND HEATING PLANT OF FARM SHOP AND CLASSROOM OF DEPARTMENT OF VOCATIONAL AGRICULTURE

4. To sense the desirability of properly caring for and housing all farm tools and machinery and plan for its storage.

IX. *Power Machinery*

1. To be able to make all the ordinary operating adjustments and do the repairing jobs connected with gas engines; namely, adjust carburetor, clean spark plugs, clean out carbon, grind valves, change oil and grease, adjust bearings, understand ignition so as to locate and correct ignition troubles.

X. *Power Transmission*

1. To know the different kinds of belts and the kind of work for which each is suited.
2. To know one good way to lace each kind of belt used in farming.
3. To know how to operate and care for belts.
4. To know the kinds of pulleys used in farming occupation and figure sizes required to obtain desired speed.

XI. *Plumbing*

1. To know pipe sizes and kinds of pipe fittings.
2. To be able to cut, thread, and ream a pipe and make a tight joint.
3. To be able to repair leaky faucets and valves.
4. To know how to operate and care for a water system for a rural home.

XII. *Electricity on the Farm*

1. To know the kinds of current used on farms for light, heat, and power.

2. To know wiring materials and systems, their construction, care and repair.
3. To have a practical knowledge of lighting.
4. To have a practical knowledge of domestic electrical appliances, construction, care and repair.

XIII. *The Farm Shop*

1. To select a place in a building on the farm or plan a structure suitable for doing farm construction and repairwork.
2. To be able to select and care for the tool equipment suited to the needs of any particular farm.
3. To be able to build a workbench, sawhorse, and other necessary shop equipment.
4. To arrange the equipment and tools so that farm construction and repairwork can be done with greatest convenience.

Suggestive Curriculum

The following course in shopwork is suggestive only for a *general* farming community. Wherever specialized farming is done, such as poultry or fruit production, the course is to be changed to more nearly meet the local needs. It should be kept in mind that farm-shop work shall consist of teaching the farm boys how to do the ordinary repair and construction work that arises on farms of the community with such tools and equipment as farmers can reasonably be expected to have.

Name of Course	*Number of Periods*				
	First Year	*Second Year*	*Third Year*	*Fourth Year*	*Total*
Carpentry and Woodworking	19	20			39
Fitting saws	5	3			8
Soldering		3			3
Cold-metal work	2	2	2		6
Tool sharpening	4	3	2	2	11
Forge work	3		7	5	15
Harness repair			6		6
Ropework	4	3	1		8
Concrete work		6			6
Field machinery			11	7	18
Overhauling power machinery			5	8	13
Power transmission				3	3
Plumbing and water supply	3		6		9
Leveling and drainage				6	6
Electricity on the farm				9	9
Totals	40	40	40	40	160

NOTE: The shopwork is to occupy 40 double periods a year. Painting included in courses 1 and 10. Drawing included in courses 1, 9, and 14, and generally as it contributes to the work.

Carpentry and Woodworking

1. Fitting handles to hammers, axes, shovels, forks, pick-axes, etc	2	3			5
2. Painting	1				1
3. Drawing	2	3			5
4. Cutting, fitting, and putty-ing glass		2			2
5. Cutting and framing rafters	1	1			2
6. Construction work, suggested jobs: water stand, mash hopper, saw clamp, feed rack, etc. Nail box, saw horse, flats, etc	10	8			18
7. (Additional construction jobs)	3	3			6
Totals	19	20			39

Fitting Saws

1. Fitting ripsaws	2				2
2. Fitting cutoff hand saws	3				3
3. Fitting timber saws		1			1
4. (Fitting buzz or circular saws)		2			2
Totals	5	3			8

Soldering

1. Preparing a blowtorch for use, tinning a copper, and soldering holes in various metals or operating an alcohol torch		1			1
2. Repairing utensils, holes, and seams		1			1
3. Soldering or sweating a patch on tin and additional repair jobs		1			1
Totals		3			3

Cold-Metal Work

1. Measuring and marking on metal, using hack saw and cold chisel, filing, and drilling	2				2
2. Riveting, using taps and dies		2			2
3. (Additional jobs)			2		2
Totals	2	2	2		6

Tool Sharpening

1. Grinding wood and cold chisels	1				1
2. Grinding plane bits	1				1
3. Grinding axes or hatchets	1				1
4. Grinding or filing sheep shears, pruning shears, or scissors	1				1
5. Grinding knives, draw-shaves, and drills		1			1
6. Filing hoes, auger bits, and shears		2			2
7. Grinding scythes and sickles			1		1
8. Grinding mowing-machine sickles			1		1
9. Sharpening other tools, such as plow points, disks, cultivators, shovels				1	1
10. Additional tool sharpening, such as hay-knife, ensilage-cutter blade and shear plate				1	1
Totals	4	3	2	2	11

NOTE: Truing an emery grinder should be given when needed at any time.

Forge Work

1. Build and keep a fire, shape, sharpen, and temper cold chisels, punches, center punches, pickaxes, staple puller, mattock, etc			5	2	7
2. Heat, measure, bend shape, straighten, draw out, upset, punch, cut, rivet, etc., as applied to work on machin-					

Name of Course	Number of Periods: First Year	Second Year	Third Year	Fourth Year	Total
ery repair and the shovels and teeth of cultivators and harrows	3		2	3	8
Totals	3		7	5	15
Harness Repairing					
1. Make a wax thread and stitch parts of a harness			1		1
2. Rivet, with and without a riveting machine, as needed on a harness			1		1
3. Repair hames, tugs, traces, breeching			2		2
4. Apply repair parts to a harness			1		1
5. Clean and oil a harness			1		1
Totals			6		6
Ropework					
1. Whipping and crown and end splice	1				1
2. Learning knots and hitches useful to farmers: bowline, bow-on-bight, sheet bend, square, millers', clove, timber, half hitches	1				1
3. Long splice and above knots continued	1				1
4. Short splice	1				1
5. Temporary rope halter and review of knots and hitches through the use of problems		1			1
6. Permanent rope halter: side and eye splices		1			1
7. Reeve a set of block and tackle and figure problems		1			1
8. Rope review through the use of problems			1		1
Totals	4	3	1		8
Concrete Work					
1. Build a section of concrete walk or platform		2			2
2. Build a wall or steps		2			2
3. Repairwork in concrete as applied to farm buildings		2			2
Totals		6			6
Field Machinery					
1. Each member of a class to inventory the farm machinery equipment of a farm. Find the total investment			1		1
2. Machines used on the farms of the community to be brought into the shop and generally overhauled:					
a) Clean machines					
b) Replace broken castings					
c) Repair or replace broken wooden parts				3	
d) Forge repair parts when practical					
e) Replace lost or broken belts			10		13
f) Adjust bearings					
g) Babbitt bearings					
h) Paint wood and iron					
3. Study care, operation, and housing of machinery				1	1
4. Make plans of implement sheds and other storage places				3	3
Totals			11	7	18
Overhauling Power Machinery					
1. Automobile mechanics					
a) Patch casing			1		1
b) Ignition and care of storage battery			1		1
c) Clean carbon and grind valves			3		3
2. Single-cylinder gas engines					
a) Studying gas-engine principles				1	1
b) Cleaning and examining gas engines				1	1
c) Cleaning carbon, grinding valves, fitting rings				1	1
d) Ignition and timing				1	1
e) Studying working and adjustments of the carburetor				1	1
3. Tractors (Studying the cooling, ignition, and carburetor systems)				3	3
Totals			5	8	13
Power Transmission					
1. Belt lacing, kinds of belts, and method of lacing each kind				1	1
2. Pulleys: kinds, sizes, speeds				1	1
3. Line shafting: installation, speeds				1	1
Totals				3	3
Plumbing and Water Supply					
1. Study of pumps and water systems			1		1
2. Cutting and fitting pipes and connections	2		2		4
3. Packing faucets and valves	1		1		2
4. Installing sink, traps, and waste line			2		2
Totals	3		6		9
Leveling and Drainage					
1. Leveling and running a line of levels				3	3
2. Figuring data, cuts, etc				1	1
3. Additional leveling and drainage problems and practice; such as staking out, taking levels, and making calculations for a building or septic tank				2	2
Totals				6	6
Electricity on the Farm					
1. Study of electricity used on farms for light, heat, and power				1	1
2. To know wiring materials and systems, their construction, care, and repair				4	4
3. To have a practical knowledge of lighting, such as direct lighting effects, types					

Name of Course	Number of Periods First Year	Second Year	Third Year	Fourth Year	Total
of lighting effects, etc.....				1	1
4. To have a practical knowledge of domestic electrical appliances, their construction, care, and repair, namely, toasters, irons, vacuum cleaners, sewing machines, water systems, etc.				3	3
Totals.....				9	9

TEXT- AND REFERENCE BOOKS ON FARM-SHOP WORK

Farm Machinery and Equipment, H. P. Smith, McGraw-Hill Book Co., New York, N. Y.

Agricultural Mechanics, Robert H. Smith, J. B. Lippincott Co., Philadelphia, Pa.

Farm Machinery, A. A. Stone, John Wiley & Sons, Inc., New York, N. Y.

Teaching Farm Shop Work and Farm Mechanics, Schmidt, Ross, Sharp, The Century Co., New York, N. Y.

Equipment for the Farm and Farmstead, H. C. Ramsower, Ginn and Co., Boston, Mass.

Agricultural Engineering, J. B. Davidson, Webb Publishing Co., St. Paul, Minn.

Construction and Repair Work for the Farm, T. F. Struck, Houghton Mifflin Co., Boston, Mass.

Farm Machinery and Farm Motors, Davidson & Chase, Orange Judd Publishing Co., New York, N. Y.

Roof Framing, Rees and Nelson, Bruce Publishing Co., Milwaukee, Wis.

Fitting Farm Tools, Roehl, Bruce Publishing Co., Milwaukee, Wis.

Farmer's Shop Book, Roehl, Bruce Publishing Co., Milwaukee, Wis.

Farm Mechanics, Field, Olson & Nylin, The Century Co., New York, N. Y.

Farm Mechanics, Robb & Behrends, John Wiley & Sons, Inc., New York.

Agricultural Machinery, J. B. Davidson, John Wiley & Sons, Inc., New York, N. Y.

Principles of Farm Mechanics, M. A. Sharp and W. M. Sharp, John Wiley & Sons, Inc., New York, N. Y.

Farm Mechanics, Crawshaw and Lehmann, The Manual Arts Press, Peoria, Ill.

Lumber and Its Uses, R. S. Kellogg, The Radford Architectural Co., Chicago, Ill.

Carpentry, Griffith, The Manual Arts Press, Peoria, Ill.

Farm Buildings, Foster and Carter, John Wiley & Sons, Inc., New York, N. Y.

Belts and Lacings, J. G. Dent, Student's Book Store, St. Paul, Minn.

Elementary Forge Practice, Harcourt, The Manual Arts Press, Peoria, Ill.

Forging and Smithing, L. C. Jones, The Century Co., New York, N. Y.

Soldering, J. G. Dent, Student's Book Store, St. Paul, Minn.

Job Sheets in Home Mechanics, Set 1 and 2, F. E. Tustison, The Bruce Publishing Co., Milwaukee, Wis.

Job Sheets for the Practical Electrical Shops, F. E. Tustison, The Bruce Publishing Co., Milwaukee, Wis.

Forge Work, Ilgen, The American Book Co., Chicago, Ill.

Operation, Care and Repair of Farm Machinery, John Deere & Co., Moline, Ill.

Electricity on the Farm and Rural Communities, Vol. IV, No. 1, Committee on Relation of Electricity to Agriculture, 1120 Garland Bldg., Chicago, Ill.

Farm Lighting, Bulletin 53, National Electric Light Association, Nela Park, Cleveland, Ohio.

Home Lighting Fundamentals, Bulletin L. D. 10, National Electric Light Association, Nela Park, Cleveland, Ohio.

Swoopes Lessons in Practical Electricity, D. Van Nostrand Co., New York, N. Y.

Automotive Essentials, Kuns, The Bruce Publishing Co., Milwaukee, Wis.

Automotive Trade Training, Kuns, The Bruce Publishing Co., Milwaukee, Wis.

Motor Vehicles and Their Engines, E. S. Fraser and R. B. Jones, D. Van Nostrand & Co., Inc., New York, N. Y.

Concrete Construction for Rural Communities, Seaton, McGraw-Hill Book Co., New York, N. Y.

Vocational Course in Concrete, Plans for Farm Buildings, Permanent Farm Construction, Colometric Tests for Sand, Portland Cement Co., 347 Madison Ave., N. Y., or 33 Grand Ave., Chicago, Ill.

Sheets from a Stage Carpenter's Notebook

*Page Kirk**

(*Continued from the April issue*)

Colonial

EARLY American and English Georgian are well known because of the numerous authentic reproductions. Many designs are now available for the school shop. A number of such drawings have been published in back numbers of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. The labor-saving short cuts of stage carpentry suggested in the accompanying plates are equally applicable to these periods. However, very old pieces are both valuable and scarce. Fortunately they are the ones most easily made. The designs in Figure 4 are suitable for any colonial interior, from one in a Jamestown log cabin on, in any eastern state; although the painted chest would hardly be found south of Pennsylvania, unless it was in some Dutch home in Virginia. The same furniture is equally good for a cottage set. Primarily it is for these two types, but it is not out of place in a modern house.

Mahogany came into use by English cabinetmakers after 1700; before that, they worked in other dark woods, mostly oak or walnut. White pine and maple were in favor with our early American forefathers. It is not necessary to use exactly the same woods, but they do dictate the color of finish, and designs must come within their limitations. Proportions should be respected, they are very typical of the different periods. It may be a temptation to cut your coat to suit your cloth, but, besides being less satisfactory to your own eye, the critics in the audience may blame such changes to ignorance.

*Washington, D. C.

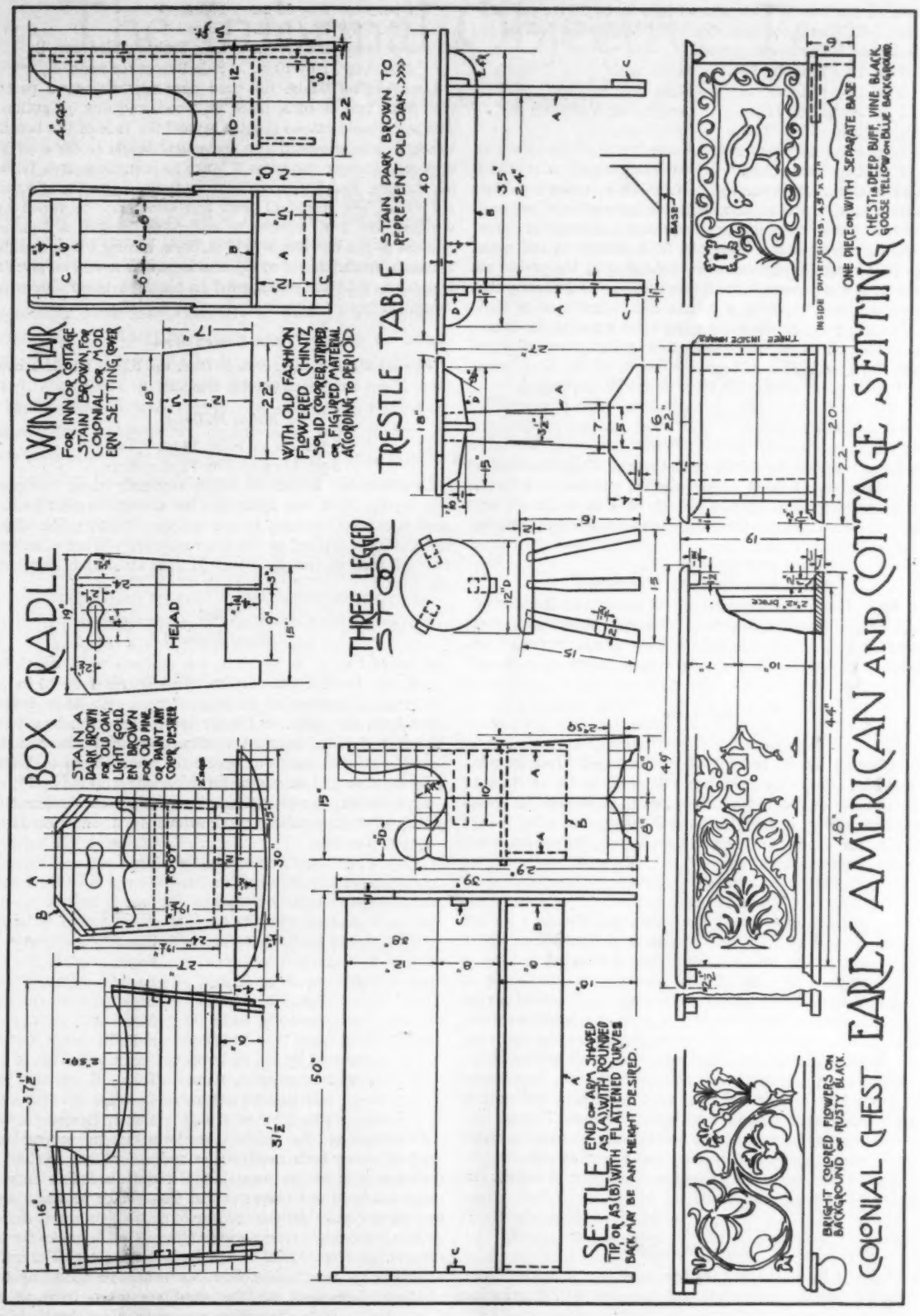

WING CHAIR
FOR INN OR COTTAGE STAIN BROWN FOR COLONIAL OR MOD ERN SETTING OMIT
WITH OLD FASHION FLOWERED CHINTZ, SOLID COLORED STRIPED OR FIGURED MATERIAL ACCORDING TO PERIOD
TRESTLE TABLE
STAIN DARK BROWN TO REPRESENT OLD OAK.
THREE LEGGED STOOL
BOX CRADLE
HEAD
STAIN A DARK BROWN FOR OLD OAK, LIGHT GOLD EN BROWN FOR OLD PINE, OR PAINT ANY COLOR DESIRED
FOOT
SETTLE
END OR ARM SHAPED AS (A) WITH ROUNDED TIP OR AS (B) WITH FLATTENED CURVES BACK MAY BE ANY HEIGHT DESIRED.
ONE PIECE OR WITH SEPARATE BASE
(CHEST IS DEEP BUFF, VINE BLACK, GOOSE YELLOW ON BLUE BACKGROUND
BRIGHT COLORED FLOWERS ON BACKGROUND OF RUSTY BLACK
COLONIAL CHEST
EARLY AMERICAN AND COTTAGE SETTING

FIG. 5

The colonial color range was limited, mostly earth colors. For painted furniture confine the choice to buff, colonial blue, brick red, yellow ocher, black and white.

Wing Chair

Bill of Material

Two pieces 1 by 12 in. by 10 ft., cut into two 5-ft. lengths for sides, two 29-in. lengths for sides, two 22-in. lengths for

front of seat and B. Two pieces 1 by 6 in. by 10 ft., cut into three 5-ft. lengths for back, two 19-in. lengths for bracing to back, one 20-in. length for seat.

2 pc. 1 by 12 in. by 5 ft.	Sides
2 pc. 1 by 12 by 29 in.	Sides
2 pc. 1 by 12 by 22 in.	Seat, apron A and top B
1 pc. 1 by 5 by 20 in.	Seat, top
3 pc. 1 by 6 in. by 5 ft.	Back
2 pc. 1 by 6 by 19 in.	Back bracing, C

Construction. Draw curved parts full size, make two blue prints of each, paste on wood and saw on outline. Construct as shown. Finish by staining to represent old wood or leave rough and cover with a cloth slip. The pattern on the cloth should be carefully chosen as one belonging to the period of the play. If a slip cover is used, it is best to round slightly the top of the back by padding with a roll of excelsior. A low-back armchair can be made from this same drawing. To do so, base curves on rectangular blocks 2 by 4 in. instead of 4 in. squares as given. This will cut the height of the back from 5 ft. to 3 ft. 6 in., leaving the chair otherwise unchanged.

Trestle Table

Bill of Material

One piece 1 by 6 in. by 10 ft., cut into three 40-in. lengths for top. One piece 1 by 6 in. by 4½ ft., cut into two 26-in. lengths for uprights A. One piece 1 by 4 in. by 10 ft., cut into one 36-in. length for brace B, and four 16-in. lengths for cross pieces C and D.

3 pc. 1 by 6 by 40 in.	Top
2 pc. 1 by 6 by 26 in.	Uprights A

Construction. No drawings are necessary, as it may be made directly from the illustration. Glue and screw crosspieces C and D to A. At top, cut slot for B; it should be a snug fit. Finish as shown. Should be stained dark brown to represent old wood.

Box Cradle

Bill of Material

Two pieces 1 by 10 in. by 10 ft., cut into six 37-in. lengths for sides and bottom. One piece 1 by 10 in. by 12 ft., cut into two 24-in. lengths for head, two 20-in. lengths for foot, and two 17-in. lengths for hood B. One piece 1 by 12 by 16 in., for hood A. One piece 1 by 4 in. by 5 ft., cut into two 30-in. lengths for rockers.

2 pc. 1 by 10 by 24 in.	Head
2 pc. 1 by 10 by 20 in.	Foot
6 pc. 1 by 10 by 27 in.	Sides and Bottom
2 pc. 1 by 10 by 17 in.	Sides of Hood, B
1 pc. 1 by 12 by 16 in.	Top of Hood, A
30 pc. 1 by 4 by 30 in.	Rockers

Construction. Make full-sized drawings of all curved parts. It is necessary to draw only half each of the head and foot. Make two blue prints of each curve, paste on wood and saw on outline. Construct head and foot, join with sides and fit bottom. Fasten on rockers and fit hood as shown. Because of the slants, both bottom and hood must be beveled. It requires a good workman to make a neat job of the hood. True up the hand slot in the head if the two parts do not fit exactly. Stain a dark brown to represent walnut, mahogany, or old oak; or stain a light golden brown to represent old pine or maple; or paint one of the colonial colors.

Settle

Bill of Material

One board 1 by 12 in. by 4 ft., for upper part of back. Three boards 1 by 8 in. by 12 ft. cut into five 4-ft. lengths for back, seat, and A. Two 33-in. lengths for sides, two 42 in. lengths for sides, two 13-in. lengths for side braces under seat B, one board 1 by 2 by 20 in., cut into two 10-in. lengths for arm braces C.

1 pc. 1 by 12 in. by 4 ft.	Back
5 pc. 1 by 8 in. by 4 ft.	Back, seat, and facing A
2 pc. 1 by 8 by 33 in.	Sides
2 pc. 1 by 8 by 42 in.	Sides
2 pc. 1 by 8 by 13 in.	Side Braces under seat, B
2 pc. 1 by 2 by 10 in.	Side Braces for arms, C

Construction. Make full-sized drawings of curved parts, blue print two of each, paste on wood, and saw on outline. The seat should extend slightly beyond the face of the bench. Brace C is to be placed at a convenient height to serve as an arm rest. It is necessary as a brace to join the boards forming the side. Finish with dark-brown stain to give the effect of old wood. The height of back and arms may be varied by changing the 2-in. squares to rectangles. Height of squares reduced to 1½ in. gives a 35½-in. back, turning the settle into a church bench. Height of squares increased to 3½ in. gives a high-back, old-style settle, good to place on either side of a central fireplace.

Three-Legged Stool

This stool can easily be made from the top of an old school stool. If cut from new wood it requires:

Bill of Material

1 pc. 1½ by 14 by 14 in.	Top
3 pc. 1½ by 2 by 15 in.	Legs

Construction. Round all edges, especially those to upper side of top. Slant legs some, but not enough to spread when stool is used. They must be set well into the top. The upper end should be tapered on the outer edge only. When otherwise finished, trim off feet until stool is level and stands firmly on the floor.

Chest

Bill of Material

One board 1 by 12 in. by 10 ft., cut into one 49-in. length for top, one 48-in. length for base. Two boards 1 by 10 in. by 10 ft., cut into one 49-in. length for top, one 48-in. length for base, one 44-in. length for front, one 42-in. length for back, two 19-in. lengths for sides. One board 1 by 7 in. by 12 ft., cut into one 44-in. length for front, one 42-in. length for back, two 19-in. lengths for sides. One strip 1½ by 2½ in. by 4 ft., cut into two 21½-in. lengths for cleats. One 8-ft. strip of 1-in. molding, cut into one 48-in. and two 22-in. lengths for base.

1 pc. 1 by 12 by 49 in.	Top
1 pc. 1 by 10 by 49 in.	Top
1 pc. 1 by 12 by 48 in.	Base
1 pc. 1 by 10 by 48 in.	Base
1 pc. 1 by 10 by 44 in.	Front
1 pc. 1 by 7 by 44 in.	Front
1 pc. 1 by 10 by 42 in.	Back
1 pc. 1 by 7 by 42 in.	Back
2 pc. 1 by 10 by 19 in.	Sides
2 pc. 1 by 7 by 19 in.	Sides
2 pc. 1½ by 2½ by 21 in.	Top Cleats
1 pc. 1-in. molding, 46 in.	Base
2 pc. 1-in. molding, 21 in.	Base
4 pc. 2 by 2 by 18½ in.	Corner Braces

Construction. No special directions are necessary; the drawing shows both construction and decoration. A chest is useful as well as ornamental, for it can do double duty as stage furniture and property box. Colonial or peasant chests may be elaborated by the addition of a stand, such as is shown. It is a four-sided frame with 12 by 12 in. triangles at the corners, set from ½ in. to 1½ in. below the top. The inside should fit the base of the chest. Six inches is a good height.

These dimensions for the chest are taken from an old Pennsylvania Dutch heirloom, a museum piece, but it is not necessary to follow them slavishly. As given, it is of sufficient size to set a stage, with the addition of a few neutral units. It may be either reduced to scale or changed. One variation, often found in the real thing, is to interchange width and height.

(To be continued)

The Informal Objective Test

*William L. Hunter**

THERE is an independence of thinking evident in the American teaching profession which can be equaled nowhere else in the world. No matter how good a test any individual or set of individuals would make, there would yet be a large group of teachers who would say, "Be it ever so imperfect there is no test like one's own." No doubt there is a richness and quality which eventually come from diversity of thought and experimentation in education which can come in no other way. Trial-and-error methods are yet to be relied upon for a large share of the new in education.

One industrial-arts teacher gets an idea in regard to testing and immediately proceeds to work it out. A thousand others are doing the very same thing. Within the next ten years tremendous advances are certain to be made in industrial-arts testing.

The informal objective test is usually made up by each teacher himself and is given to his class at whatever he thinks is the opportune time. The subject matter which has been covered in his demonstrations, lectures, instruction sheets, or assigned readings is usually sampled by his informal objective test.

Meaning of the Term "Objective"

When a question is truly objective, all authorities agree as to what the correct answer should be. Thus the question, "Does summer follow spring?" would be objective because all authorities would agree that "yes," rather than "no," was the correct answer. However, the question, "Is it colder in winter than in summer?" would not be objective because people in one half of the world would answer "yes" and those in the other half answer "no."

Simply because a question is labeled "true-false" is not a guarantee that it is an objective question. Likewise, questions may be written out as the essay examination questions are and yet be objective, provided authorities agree as to what are the correct answers. Other things being equal, the objectivity of a test is directly proportional to the percentage of factual items included. There is no such thing as an objective test made up of argumentative statements. However, the world would never progress very far if all persons refused to have anything to do with argumentative issues. Lack of objectivity may be caused by including questions which may be answered more than one way by authorities or by so wording the statements that one person understands the question one way and another understands the question the other way. Ambiguous questions have no place in any kind of test or examination. For instance, the following true-false statement which was found in an informal physics test is a puzzler: "When the smoke comes down the air is heavy and it is likely to rain. T. F." Greater objectivity is secured with short questions than with long ones. The following objective arithmetic question is so long that it is a puzzler: "Minnie is 12 years old now. Sue is 6 years older than Minnie who is 4 years younger than Emma. If Emma will be 17 a year from now, how old was Minnie a year ago? A. ——— years."

Informal objective tests may be objective and yet not be scored correctly. The writer has actually witnessed teachers who were giving their own informal tests which were truly objective and yet because of their own misinformation were marking some of their pupils' responses in regard to some of the questions "wrong," when they should have been marked "right." Of course, this is not a fault of the objective test any more than it is a fault of the written essay examination if pupils are not graded fairly. The quality of testing and the quality of teaching both must be improved if either is to be made most effective in American education. Good tests will tend to make better teaching possible, and when we have better teaching we can use better tests.

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Kinds of Objective Tests

There have been many kinds of tests invented but thus far only four or five have been used extensively in industrial-arts education. The true-false (including the yes-no test), the multiple-choice, the completion, the recall, and the matching types have probably included from 90 to 95 per cent of all tests given in industrial-arts work. Each of these tests will be described in detail and some specific suggestions will be made as to their construction.

The Yes-No and True-False Tests

The same suggestions in general apply in constructing both the yes-no and the true-false tests, hence, the two are considered together. Pupils seem to like a yes-no test much better than they do the true-false test. Also there are fewer objections from a psychological angle, hence, it is urged that teachers experiment with both kinds to see which they believe serves their needs the better. The true-false test is made up of several statements, about one half of which are false and the remainder of which are true. The person taking the test may identify the statements as being true or as being false in any one of several ways. He may place a "T" (true) or an "F" (false) before or after each of the statements, he may indicate the true statements with a plus sign (+) and the false statements by a negative sign (—), or he may underline the letter "T" or "F" which have been mimeographed on the sheet with the questions. The yes-no test is usually answered by encircling either the word "yes" or "no" which appear after or before each of the questions. Encircling the correct response is much preferred to writing the response in since less time is taken this way, there is less confusion in scoring, and a scoring device can be more easily made up which will fit all the tests. Some suggestions follow for the construction and use of yes-no and true-false tests:

a) The questions or statements should be short, an average length not to exceed 10 or 12 words and a maximum length of not more than 20 to 24 words.

b) Avoid unimportant questions or statements, ambiguous wording, double negatives, and involved sentence structure.

c) There should not be less than 50 questions and preferably more. If fairly high reliability is desired, the results of several short tests may be combined or one test of from 150 to 200 questions should be used.

d) There should be no possibility of more than one answer to any of the questions.

e) The "yes" questions and "no" questions or true statements and false statements should be arranged in chance order.

f) There should be about as many "yes" questions as "no" questions; likewise true statements and false statements.

g) Avoid using the words "never" and "always," "all" and "none," and like extremes.

h) Avoid using the word "not" in order to change from a

"yes" to a "no" question or from a true to a false statement.

i) Do not use the words "or," "nor," "either," and "neither."

j) Use words in general which are common to the pupils' vocabulary. If specialized terminology is used, try to have not more than one or two such words in a question or statement. The question increases in difficulty as the number of variables increases.

k) One question should not depend for its answer upon the answer to a previous one.

l) From four to ten yes-no questions or true-false statements can be answered by high-school pupils per minute of test time.

m) The diagnostic and review values of the yes-no or true-false test are greatly increased if the subject being taught is divided up into units and a block of test questions is prepared for each unit of subject matter.

n) The yes-no and true-false tests are of value in motivating pupils to review. The dull pupils are ordinarily motivated more than the bright ones.

o) Correction of the yes-no or true-false test by the pupils themselves immediately after the test is given greatly increases the educational value of the test. This procedure permits the pupils to fix more firmly in their minds those responses which were correct and to alter their thinking for those responses which are wrong.

p) Yes-no and true-false tests are usually scored by using the formula: Rights minus wrongs = score. Do not give negative scores.

q) A pupil's improvement over his own previous test score should be emphasized rather than his relative achievement with other members of the class.

r) Considerable educational value is to be had if pupils are required to make out yes-no or true-false questions to be handed in for the teacher to use in making up review tests.

The Multiple-Choice Test

This test has been widely used as an objective means of checking up on the amount of factual information which an industrial-arts pupil possesses. Some have objected to the recall or completion-sentence type of test because occasionally it has been difficult to find statements for which one word alone always seemed to be the plausible response, hence, the multiple-choice test was used to control the answers which could be given and thus make the test more objective. That the test has met with approval by many teachers is shown by the fact that it is widely used. Especially in standardized industrial-arts tests has it been utilized. A few suggestions follow which are aimed to help the industrial-arts teacher in making up better informal multiple-choice tests.

a) Include in the list of facts to be tested only those which are most frequently used in the shop or in life situations.

b) There should be but one possible answer to each of the statements. By giving a preliminary tryout of the test, then discussing the results with the class the teacher will often see how some of the statements may be construed to have different meanings than was intended. These statements with double meaning should be revised or eliminated from the test.

c) Avoid multiple-choice questions with series responses. For instance, "Which one of these grades of sandpaper is the coarsest? (1) No. 00, (2) No. 0, (3) No. 1, (4) No. 2 . . . ( )." The first and last responses are the only two which will be scored to speak of. The item of information is better suited to being used in a yes-no or true-false test.

d) Do not have two answers, then have the third a combination of the two. For instance, when inking horizontal lines the draftsman begins (1) at top of sheet, (2) at bottom of sheet, (3) either top or bottom . . .( ). Again the question will have but two responses which are scored to any appreciable extent. The third response is simply dead material. The item, again, had better be used in the yes-no or true-false form.

e) If but two plausible answers can be found, throw the question into the yes-no or true-false form. This suggestion grows out of the two suggestions just mentioned.

f) Avoid "a" and "an" combinations which will give away the correct answer; for instance, "Nibs are found on an (1) auger bit, (2) chisel, (3) hammer . . . ( )." The statement should be rewritten thus, "Nibs are found on (1) an auger bit, (2) a chisel, (3) a hammer . . . ( )."

g) Do not have silly or obvious answers; for instance, "Shimmy in the front wheels of an automobile may be caused by (1) a dent in a rear fender, (2) unbalanced front wheels, (3) a leaky gas tank . . .( )."

h) Arrange statements so that responses are at the end. Wrong: A (1) chord, (2) diameter, (3) radius passes through the center of a circle. Right: Which one of these passes through the center of a circle? (1) a chord, (2) a diameter, (3) a radius . . . ( ).

i) Each of the relative scoring positions should have about the same total number of correct responses. Thus, in a 50-question, three-choice test there might be 16 questions correctly answered by placing "1" in the answer column, 17 answered correctly by placing "2" in the answer column and likewise 17 answered correctly with "3" in the answer column.

j) The statements should be arranged by chance. Some have arranged multiple-choice tests so that a number series results if the questions are answered correctly; for instance, the answer column might appear thus for a four-choice test, 314231423142, etc. While this makes for rapid scoring, yet the bright student who gets most of the questions right at the beginning of a test is likely to stumble onto the combination. Then, too, if the tests were used a second time or if the practice were repeated many times, the pupil would spend his time looking for the key series instead of passing the test. It is difficult to stack the deck when dealing the cards of human nature.

k) Use from three to five responses. For a given number of questions, greater reliability is obtained by using five responses than by using three; however, more time is required to answer a five-response item than to answer a three-response item. Per unit of test time there is little difference in reliability (accuracy of measurement) in the two.

l) From three to six multiple-choice questions can be answered by high-school pupils per minute of test time.

m) Use at least 50 items in a multiple-choice test unless it is combined with other tests to secure the necessary accuracy of measurement.

n) By a preliminary try-out of the test check the various items to see that the wrong pupil responses are about equally divided between the wrong answers. If most of the wrong responses pile upon one of the answers the question should be revised.

o) For sake of ease in scoring, arrange an answer column at the right so that the numbered responses can be written in. Much more time is needed to score the multiple-choice test in which the responses are underlined.

p) The multiple-choice test is ordinarily scored "Number right." If it is desired to correct for guessing the three-choice test is scored "rights minus one-half wrongs"; the four-choice test is scored "rights minus one-third wrongs"; and so on.

The Completion Test

The important difference between the completion test and the other types which have been mentioned is that the response must be invented by the pupil. In the other types thus far mentioned the responses were supplied. All the pupil had to do was to accept or reject them as he thought best. If the pupil did not know for certain which was the correct answer he could make a good guess out of from two to five answers which were supplied. Of course he might be wrong, but there is some indication that good guessing ability can be developed in human nature quite as well as some other abilities. In life

situations the responses to important questions are seldom placed on a shelf and labeled for us to take our choice. Our responses or answers in general must be invented. To this extent the completion test is more difficult and probably a more valid method of testing that which has been accomplished by industrial-arts work.

In the completion test some truth or important fact in sentence form is written out. Some key word is then eliminated so that the pupil in the test must write in the missing item, for instance, "Nails are driven with a (an) ————." In this item of fact or truth the word "hammer" has been deleted and the blank space remains in which the pupil can write his response. A few suggestions follow as possible guides to those who wish to make up their own informal completion tests:

a) Use short sentences and omit not more than one or two words. A sentence which has been so denuded that it contains nothing but prepositions and indefinite articles can be answered almost any way and therefore loses its objectivity entirely.

b) Omit only key words, words which have important meaning. Thus, in this sentence, "The term 'penny' refers to the size of nails" the two words of greatest importance are "penny" and "nails." These two words should each be deleted one at a time to see which form of the sentence would make the best test item. Probably the word "nails" only should be left blank so that the test item finally reads thus, "The term 'penny' as used by the carpenter refers to the size of ———."

c) Do not omit one of a pair of words which are combined in ordinary usage. For instance, "A compass needle points north and ———," or "Nails are driven with a claw ———."

d) A separate blank should be provided for each word omitted. For instance, "A carpenter drives nails with a (an) ———— ————." All blanks should be left the same length. Some testers have made up dotted blanks, one dot to represent each letter of the word eliminated, but the practice is not recommended because the pupil will spend much time figuring out the number of letters in a word rather than in doing some thinking.

e) Provide no mechanical clues to missing words. All blanks should be the same length. If the last word before a blank is either "a" or "an" use both forms of the article thus, "Woodsmen chop wood with a (an) ————."

f) If possible, word each statement so that the blank is at the end. First, this permits the pupil to get all the necessary clues before the blank is encountered for which he must supply the response. Secondly, this permits the blanks all to be extended to the right-hand side of the sheet where scoring is much easier. Thus,

"Baseball bats are usually made of. . . . . *ash.*"

g) Do not copy word for word statements direct from a text. First of all, this practice places a premium on rote-memory learning and reduces the thinking process to nearly zero. Secondly, most statements in a text depend for a part of their meaning on what precedes and follows. The statements, therefore, should be reworded if possible in accord with the foregoing suggestions.

h) The completion test can be successfully combined with pictures and drawings. A series of numbered illustrations can be provided and each numbered statement can refer to the numbered illustration. The use of drawings should be encouraged in the make-up of industrial-arts tests since so much dependence in industry is being placed on an understanding of graphical language.

i) Give completion tests a preliminary tryout either to some coworkers or to a few students. This will enable one to discover those statements for which several plausible responses exist and to eliminate ambiguous or involved statements, which may have crept in.

j) The completion test is correspondingly more difficult than the yes-no and multiple-choice types. It also gives a higher reliability (greater accuracy of measurement) with a given number of items than do the yes-no and multiple-choice types.

k) If possible avoid a scoring system which gives partial credits. If but one or two blanks are left open in each statement and if the statements are arranged in order of difficulty, each total statement may be given credit only if the answer is wholly correct. Where long statements are used and where many blanks are provided, this suggestion cannot be followed. It would be much better, however, to break the long statement up into several short ones.

l) When the blanks are not arranged at the end as suggested, a cut-out stencil is of great aid in scoring.

The Recall Test

The recall test is very similar to the completion test. A question is often asked and a blank is provided in which to write the answer, thus, "What tool does a carpenter use to drive nails? ————." "What tool is used by a machinist to make inside screw threads, as in a nut? ————." Many of the suggestions which were given in regard to making completion tests also apply to the recall test, hence they will not be repeated. The recall test is probably more nearly similar to test situations as they appear in life than most of the other so-called objective types. A recall test is practically free from guessing and is one of the most accurate means of measurement which the industrial-arts teacher may use. It can be combined very well with pictures and illustrations. Numbered pictures of tools may be pasted on a sheet. The pupils are then asked to supply the names on numbered sheets. Some teachers place out on the shop benches such objects as tools, various kinds of fastenings and typical examples of construction. These items are tagged and numbered. Again the pupil is asked to supply the desired information on numbered sheets which are furnished to him at the time of the test.

Other Kinds of Objective Tests

The foregoing tests include most of those which are commonly used. However, a few of the special types will be briefly noted here.

The matching test has been used by some. This type of test is practically free from guessing and is very reliable as a means of measurement.

The missing-line test has been used quite extensively in mechanical drawing. This is similar to the completion test as it ordinarily appears. In the missing-line test a perspective of the object is usually given and then in the three-view drawing which accompanies the perspective there is one line which must be supplied by the person who takes the test. This test has been favorably received by teachers of mechanical drawing and there is little doubt but that the future will see many tests of this nature. In other drawing tests dimensions have been left out and by a process of calculation must be supplied by the person taking the test.

A test which has not been greatly used for practical testing purposes but which has proved of interest whenever it has been tried is what is known as the "What-is-wrong-with-this-picture?" test. A line is misplaced in a drawing; two dry cells are improperly connected to a doorbell; a boy is grasping a hammer handle improperly; some have a T square with the head against the lower edge of the drawing board; a wood screw is drawn with left-handed threads, and so on. The number of common errors which may be pictured is almost without end. These could well be arranged in some sort of objective test and would prove worth while both educationally and from a test standpoint.

The so-called rearrangement test has been used especially by Newkirk in making his home-mechanics tests. The steps of procedure in doing an operation are set down in sequence and then are disarranged for test purposes. The person taking the test must then rearrange the steps of procedure in correct order.

Summary and Conclusions

Objective tests are really objective insofar as authorities are in agreement regarding correctness of responses to the tests. Many forms of objective tests have been devised. The yes-no and true-false tests have been extensively used. The main objections to the true-false tests are that it is subject to guessing and that it may fix wrong responses in the minds of the pupil. The latter of these objections has not been raised so strongly in the case of the yes-no test. The multiple-choice test has been used widely and is especially adapted to the testing of factual information. The completion and recall tests are to be preferred in some ways to the other types. They tend to be less objective but are not so subject to guessing. All of these tests can be made more valid (worth while), more reliable, and more objective if they are made up in accordance with the foregoing suggestions.

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Development and Analysis of a Series of Mechanical-Drawing Tests

*Ferdinand A. P. Fischer**

IN presenting a discussion of tests, several questions may arise. *First:* What causes an author to start working out a test series? *Second:* How does he go about getting the material for the tests? *Third:* How does he determine the validity and reliability of the tests? *Fourth:* Of what practical value are the tests to the teacher and student when given? The writer will endeavor to supply answers to these questions in the order given.

The Need for a Test

The engineering drawing course at Crane Junior College is divided into a beginning course known as General Engineering Drawing I, and an advanced course, General Engineering Drawing II. Entering students who have completed two or more years of high-school drawing equivalent to four 45-minute periods a week for 36 to 40 weeks each year are qualified to take the advanced course at once. All others are required to take the beginning course. In enrolling the new students the registering teacher must rely upon the student's statement as to previous work done. Many students who are not qualified to take the advanced course, take advantage of this weakness in the registration system and enroll for the advanced work. The teacher naturally has a great deal of difficulty with such unprepared pupils and has a larger percentage of failures than usual. Some years ago the writer worked out a short set of questions embodying the units assumed necessary for a successful grasp of the advanced work. The questions were in blueprint and mimeograph form. They were given to the entering freshmen at Crane Junior College, and the results were very gratifying. The insufficiently prepared students naturally did very poorly on the tests. Many of them immediately acknowledged that they did not have sufficient high-school preparation for the advanced course and transferred to the elementary work before too much time had elapsed. This, therefore, helped to classify these drawing students more correctly and promptly, and avoided a great deal of confusion in the department at the beginning of the course.

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Procuring the Test Material

Encouraged by the helpfulness of these tests to the student and teacher alike, a thorough study was made in order to place the tests upon a secure educational foundation. The preliminary work included a mimeographed questionnaire which was sent to over 100 representative schools throughout the United States to secure data pertaining to the nature of their drawing courses, texts or mimeographed material used and length of time given to drawing in minutes per half year. A tabulation of the results disclosed a great variation in the material used as well as in the time devoted, each semester, to drawing. It therefore became necessary to use the number of minutes a student had completed in drawing work as the unit for determining the median. To make the tests of national scope, the thirty books most used by the coöperating schools were examined. Then the fundamental units, such as the use of instruments, lettering, projection drawing, geometrical drawing and pictorial representations found in all of these texts were listed. These were subdivided into minor units. The number of pages devoted to each unit was noted for each book examined. This was compared with the total number of pages in the book, thus obtaining the relative percentage of space given to each instructional unit. Using this classification as a working basis and keeping in mind the many minor units under each major unit, a series of 130 trial problems were selected, which, it was believed, would disclose the student's mastery of mechanical drawing. The amount of material devoted to a unit was in proportion to the space given that unit as found in the textbooks and instructional material examined. The 130 problems were divided into the following groups:

Test No. 1 contained 48 problems of a descriptive

nature requiring the student to choose and underscore the correct answer in pencil out of a given number of answers.

Test No. 2 had 40 problems of a pictorial type, part of which required the student to choose and underscore the correct statement out of a given number, and others in which he was directed to write the correct answer to problems, illustrated by pictures.

Test No. 3 comprised 24 problems requiring the student to supply the missing lines of a partially completed drawing of an object, an isometric (pictorial representation) of the object being given.

Test No. 4 contained 18 problems of a descriptive nature, from which the student was required to make a working drawing of an object.

It was thought that by arranging the problems of each test in a three-plane order of difficulty, the students would arrange themselves automatically into three distinct groups: poor, average, and good, according to their ability. Using Test No. 1 as an example: The first plane of difficulty included problems 1 to 16 inclusively, all arranged in an increasing order of difficulty. Problems 17 to 32 composed the second plane, and 33 to 48, the third plane. Problem 17 of plane 2, and problem 33 of plane 3 was of a fundamental unit of like nature to that of problem 1 of plane 1, but they were of a greater degree of difficulty. Theoretically this scheme seemed plausible, but after marking and tabulation the results of over 2,500 completed tests, it was discovered that the poor students did not confine themselves to the problems of plane 1. They answered the easiest ones of plane 1, omitted all the difficult problems, and skipped to the easier ones of plane 2 and 3, all of which applied to the same fundamental units. This indicated that the three-plane order of difficulty was not advisable for practical purposes. A proper, workable median score would be too difficult to obtain for such a three-plane arrangement. Consequently the author decided to try a single plane for each test with the problems arranged in an ascending order of difficulty.

Bar diagrams showing the number of correct answers for each problem of each test enabled the author to rearrange the problems in their probable order of difficulty when the nonvalid problems were omitted. By doing this the total number of problems was reduced from 130 to 68. This was advantageous as the large number of exercises made the test too cumbersome and not adaptable for the short 45-minute drawing period found in most of our high schools. Furthermore, to examine both the technical information phase of the subject as well as the actual drawing ability of the student the tests were divided into two parts: Part I consisted of 4 tests of a technical information type and Part II of 3 tests of a performance nature. Each part could be given in a 45-minute drawing period.

This second series was tried with 150 high-school students to verify the placing of problems in their order of difficulty and to secure the correct time for each test. This latter tryout produced very little variation in the order of difficulty previously established. The tests were then printed and tried out in 60 representative schools in the various sections of the United States.

To make the medians as accurate as possible, the total number of minutes of drawing work which the student had completed in a half year was taken as a unit. Using this time unit, the tests were given to classes so that approximately equal numbers of students were used for each integral time division, ranging from junior-high-school classes, who had completed 1,000 minutes of drawing to first-year college classes who had completed 48,500 minutes of drawing. The author graded and tabulated 2,500 of these completed tests. The median score of each group was carefully computed. It was found that the line connecting these median scores when plotted on cross-section paper, approximated a smooth ascending curve which we may call the median curve of scores throughout the United States for this series of tests.

Comparing the median score made by his class with the median score as shown by the curve, an instructor can quickly determine whether his students are above or below the average of the United States and also to what extent.

During the past year the author marked and tabulated the results of over 2,000 more completed tests and found no appreciable difference in the order of difficulty or the median scores as previously determined.

Validity and Reliability of Tests

By means of this verification of results, using over 4,500 completed tests, the author established the validity of the tests. In order to determine the coefficient of reliability of the tests, the author gave the same tests twice to 150 sophomore high-school students after a lapse of two weeks. A correlation of .792 was obtained. This coefficient is known as the Reliability Coefficient. It indicates to what exactness the tests measure. A reliability coefficient of .792 is considered as satisfactory for tests of this type.

This series of tests is not to be used as an intelligence test to determine the I.Q. (Intelligence Quotient) or A.Q. (Achievement Quotient). It is primarily an *analytical* or a *diagnostic* test to be used by the instructor to determine in which phases of mechanical drawing his students are weak and also as a check upon whether or not he is emphasizing sufficiently the fundamental units found most necessary to a thorough mastery of mechanical drawing.

Practical Use of the Tests

As a practical illustration of the analytical value of the tests to a school, the author will give the results obtained from 1,000 completed tests given to Crane High School students of the following groups:

350 1-B students who had completed 4,500 minutes of drawing
320 1-A students who had completed 9,000 minutes of drawing
330 2-B students who had completed 13,500 minutes of drawing

Practically all the students, whether of 1-B, 1-A, or 2-B groups had difficulty with certain problems on each test. The problems incorrectly answered were checked against the list of fundamental units. Each fundamental unit of the tests was checked against the problems in the textbook employed at Crane High School. Referring to the textbook used in the school the teacher could see for himself just where the emphasis should be given when teaching that particular phase of drawing. For example: All of the 1-B and 1-A classes had trouble with the problems of Test 4, Part I, pertaining to the completing of the three views of an object when given partially finished views and an isometric or pictorial representation of the object. The 2-B classes did well with this test. Referring to the textbook used, the author

pointed out that the theory needed in this test was clearly outlined in numerous demonstration plates. It was assumed that the instructor should supplement the demonstration plate by showing the student, by means of sketches at the blackboard, the theory outlined in the plate. Unfortunately, many teachers simply sketch the completed views, omitting the theory necessary for a thorough understanding of the work. As a consequence, the 1-B and 1-A boys when not given a rough sketch of the completed problem, were lost and unable to supply the application of the theory. The 2-B boys who had some architectural drawing in which they made a three-view working drawing of some window or door details from an isometric sketch of the same, were familiar with the application of the theory and consequently had little trouble with the problems.

In procuring the median score for a school or a school system it is absolutely necessary that the teachers giving the tests must follow the instructions as set forth in the *Manual for Teachers* (Bruce Publishing Co.) regarding the time allowed for each test. As an aid to secure the best results and to avoid the embarrassment of having the results of one teacher's classes compared with those of another, the author used the following method. Each teacher drew a card with a letter upon it, as C, A, D, etc., as the draw might determine. For example: If a teacher drew letter E and had seven 1-B classes, the first-period class would be labeled E-1; the second period, E-2, etc. After marking the completed tests and recording the student's scores on the *record sheet* supplied, the teacher placed the median score for that class at the top of the sheet. He placed the letter drawn instead of his name in the proper place. All these sheets were assembled in the main office of the school and the median score for the school determined therefrom. In this manner any teacher could compare the median score made by his classes with his school's median and also with the U. S. median without feeling that he was being checked up by the office.

This is the real objective of a series of tests. They should enable the instructor to determine definitely and quickly in just which phases of drawing his students are weak, or which fundamental units have not been emphasized sufficiently in the classroom instruction. The many ways in which these instructional units are approached, 4 tests in Part I, and 3 in Part II, offer a definite check upon which unit not mastered by the student and the diagrammatical analysis of the fundamental units in the *Manual for Teachers* is an aid to the teacher in looking up these units.

The tests may be used in the following ways:

1. As an examination given at the end of the term. Instead of purchasing a sheet or two of drawing paper for his examination, the student will purchase the test booklets. In this way the matter of financing the tests is easily disposed of.

2. They can be used at the beginning of the semester to determine how well students entering from other schools are equipped to do the work before them. This is especially true of entering college students.

3. In large school systems, where classes are formed by efficiency grouping, the tests offer an excellent method of differentiating students in regard to mechanical-drawing ability.

4. The group method of instruction enables the instructor to give a certain test when that particular unit has been completed by the class.

5. The five median score curves enable the instructor to see in which unit of instruction (technical information, or performance ability) his students are weak, and also to what extent as compared to the average for that grade of work in the United States.

6. Using as a unit the amount of work completed in minutes to date affords a quick method of comparing any particular group of students from the junior high school up through the first year of college.

7. The bar-diagram method of analysis offers the teacher a splendid insight as to just what problems his students have not mastered or have not been emphasized sufficiently in class.

8. The tests offer a valuable check between the school grade given by the teacher and what a student can really do. Often a student receives a low school mark due to indifference, laziness, lack of interest, lack of application, etc. The test scores of such a pupil will enable the teacher to awaken him, demonstrating the ability he really possesses if he will but apply himself.

9. For survey purposes in comparing the various schools in a system.

MICROMETER-READING TESTS

William T. Guenter, Eveleth, Minnesota

(See Supplement No. 242)

The two tests shown in Supplement No. 242 have been made on tracing paper so that a blue print may be made for each member of the class. The blue prints may be then cut apart so that Test No. 1 may be given to the students on one day, and Test No. 2 a week or so later. Each member of the class is given a sheet of paper and told to write down the number of the reading and the correct reading after it. The grade is obtained by multiplying the number of correct answers by five. Insist on perfect accuracy in thousandths.

Answers for Test No. I

1.	.125	6.	.025	11.	.625	16.	.900
2.	.200	7.	.400	12.	.575	17.	.800
3.	.075	8.	.375	13.	1.000	18.	.725
4.	.050	9.	.475	14.	.875	19.	.760
5.	.175	10.	.300	15.	.850	20.	.865

Answers for Test No. II

1.	.237	8.	1.250	15.	4.443
2.	.220	9.	.333	16.	1.6875 = 1 11/16 in.
3.	2.241	10.	3.983	17.	3.505
4.	.332	11.	4.722	18.	.185
5.	5.7375	12.	2.2565	19.	4.487
6.	1.8905	13.	.999	20.	3.195
7.	5.555	14.	.125 = ⅛ in.		

OBJECTIVE TESTS FOR INDUSTRIAL-ARTS COURSES

Howard B. Gundersen, Cedar City, Utah, and Fred Short, River Falls, Wisconsin

A good test must possess (1) validity, (2) reliability, and (3) objectivity.

Validity in a test means that the measuring instrument used measures what is intended to be measured and not something else. For example, a test in industrial-arts electricity should not be a measure of achievement in auto mechanics. Validity in an achievement test is less apt to be lacking than is reliability and objectivity, unless the same examination is given to two

Periodical

TRACING SUPPLEMENT No. 240, MAY, 1932
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

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ELE. WOODWORK
CLIFFORD B. SMITH

STORY OF THE PLANE

CLASS DEMONSTRATION SHEET — D-3

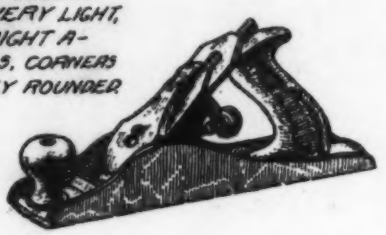
-J-

THIS SHOWS AN IMPROPER SETTING OF THE CUTTER.

NOTE:- PLANE SHOULD BE HELD TOWARD THE LIGHT WHEN BEING SIGHTED.

-K-

HERE WE HAVE IT ADJUSTED AS IT SHOULD BE, VERY LIGHT, STRAIGHT ACROSS, CORNERS SLIGHTLY ROUNDED.



A PLANE IS A CHISEL HELD IN A SUPPORTING DEVICE.

TO THE LEFT WE HAVE THE PLANE OF TODAY. THIS ONE IS KNOWN AS A JACK PLANE. IT IS THE MOST USEFUL OF ALL THE PLANE FAMILY FOR GENERAL WORK. DO YOU KNOW THESE OTHER MEMBERS, THE BLOCK, SMOOTHING, FORE, JOINTER, RABBET, UNIVERSAL ?

OUR FATHERS WROUGHT WELL WITH PRIMITIVE TOOLS: AND YOU?

PURPOSE— To follow the development of the plane from its origin to its present transient state; to study its parts, action and adjustment.

THE LESSON— DEVELOPMENT:- The first plane, if such it could be called, came on that remote day, when with hands cramped from smoothing his board with his crude chisel, man attempted to devise a means of holding it. What his earliest attempts were, we do not know, but after a time he had something like -B- This consisted of his stone cutter placed in a block of wood.

-A-

-B-

The First Plane Cutter

The material removed clogged up the opening for the cutter. What was needed? Thousands used this plane believing nothing was lacking. Had it not sufficed for their fathers?

The time came when someone, who had noticed the slivers tend to force up thru his plane-bed, enlarged the opening forming the first throat. This is shown at -C-

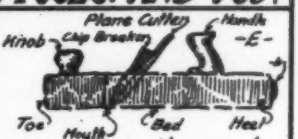
This plane did its crude work for a thousand generations until bronze, worked out in thin blades, formed perhaps the first shavings seen by man. Continuous shavings produced a new problem. They became so thick when the cutter was pushed against the grain that they would stop the plane.

-C-

This problem produced the chip-breaker. See -D- It was made of wood and when in place served to hold the cutter in position as well as to break the shavings.

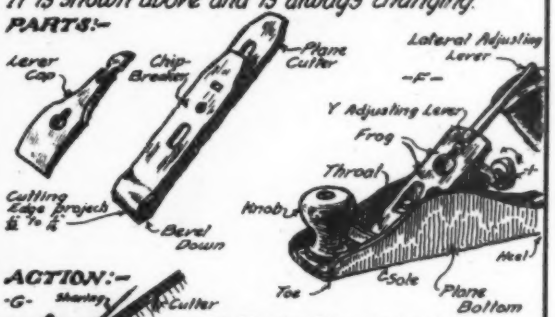
The plane bed became a finer piece of work. A handle gradually made its appearance, followed by a knob in front. Iron and steel came, but except for the cutter little change was made.

If your grandfather used a plane it looked about like the one at -E- To set the cutter lighter he struck button at -b- a sharp blow; to take a heavier cut he tapped the cutter itself on top.

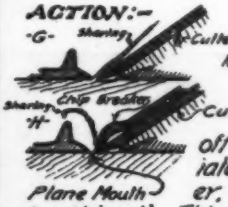


The modern plane, as we know it, was developed from the last one by a very few men. It is shown above and is always changing.

PARTS:-



ACTION:-



The plane cutter shears off a thin shaving, which immediately strikes the blunt chip breaker, bending it over sharply and breaking it. This releases the pressure on the cutting edge. See -H- At -G- is shown how a shaving would look if there were no chip breaker. If the cutter was moving against the grain, the shaving would gradually become thicker, springing the cutter down until it forced the plane to stop. The chip-breaker prevents this by breaking the shaving continually.

ADJUSTMENT:- Depth;-see Note, illus. -F- Evenness;- move lateral adjusting lever as at J-K.

QUESTIONS— Why should chip-breaker be so close to cutting edge? Does the chip-breaker explain the thinness of the modern plane cutter? Why should great care be taken that the plane cutter rests tight on the frog? In using a plane why should it never be laid down flat on the sole? What would be the first things you would do in using a plane; make a lot of shavings?

Designed by Clifford B. Smith, Buffalo, N. Y.

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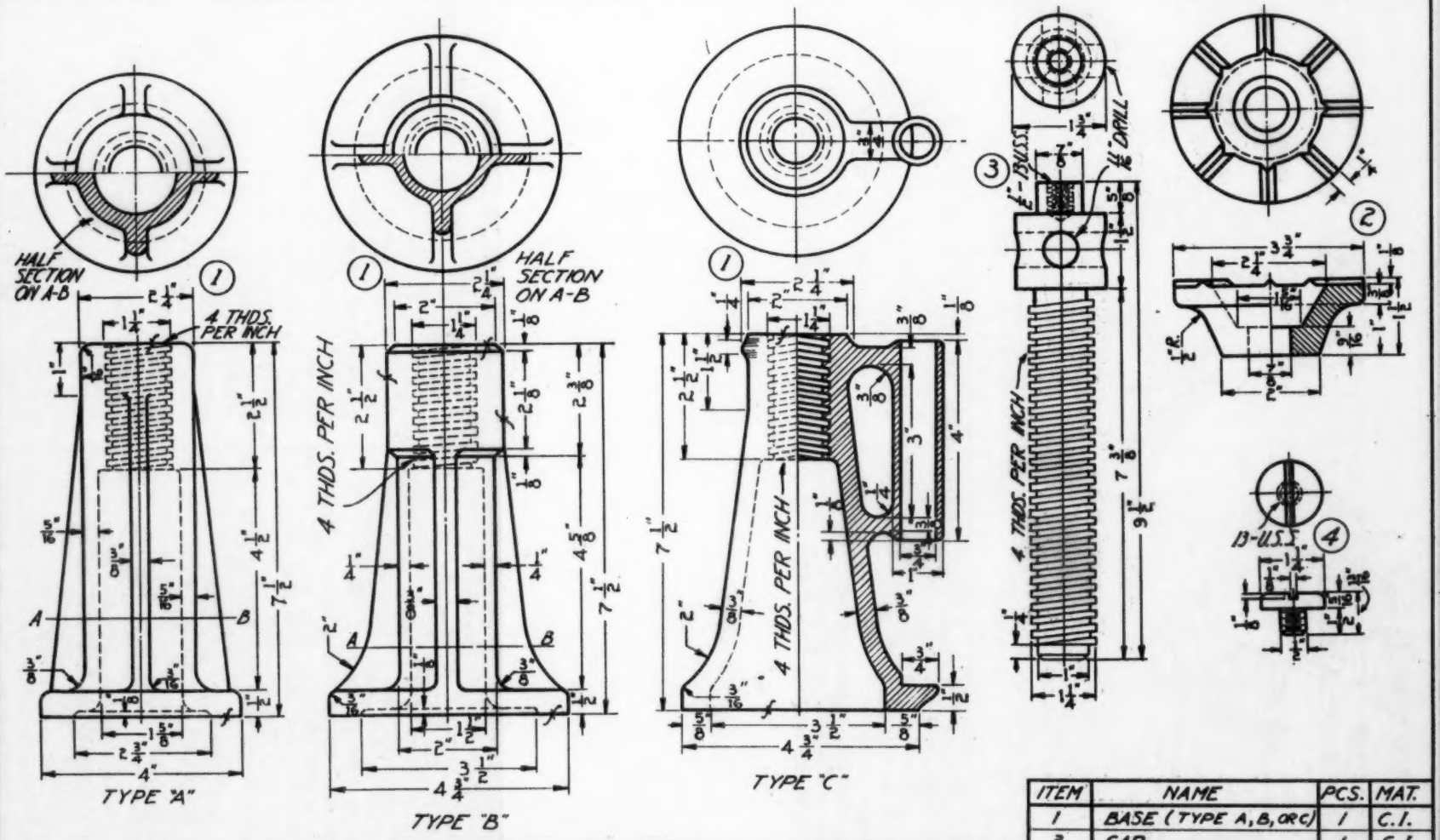

ITEM	NAME	PCS.	MAT.
1	BASE (TYPE A, B, OR C)	1	C.I.
2	CAP	1	C.I.
3	RAISING SCREW	1	C.R.S.
4	CAP SCREW	1	C.R.S.

SCREW JACKS

I.A. V.E.

Submitted by H. E. Todd, Harrisburg, Pa.

5	RAISING SCREW	1	C.R.S.
4	CAP SCREW	1	C.R.S.

I.A.V.E.

SCREW JACKS

Submitted by H. E. Todd, Harrisburg, Pa.

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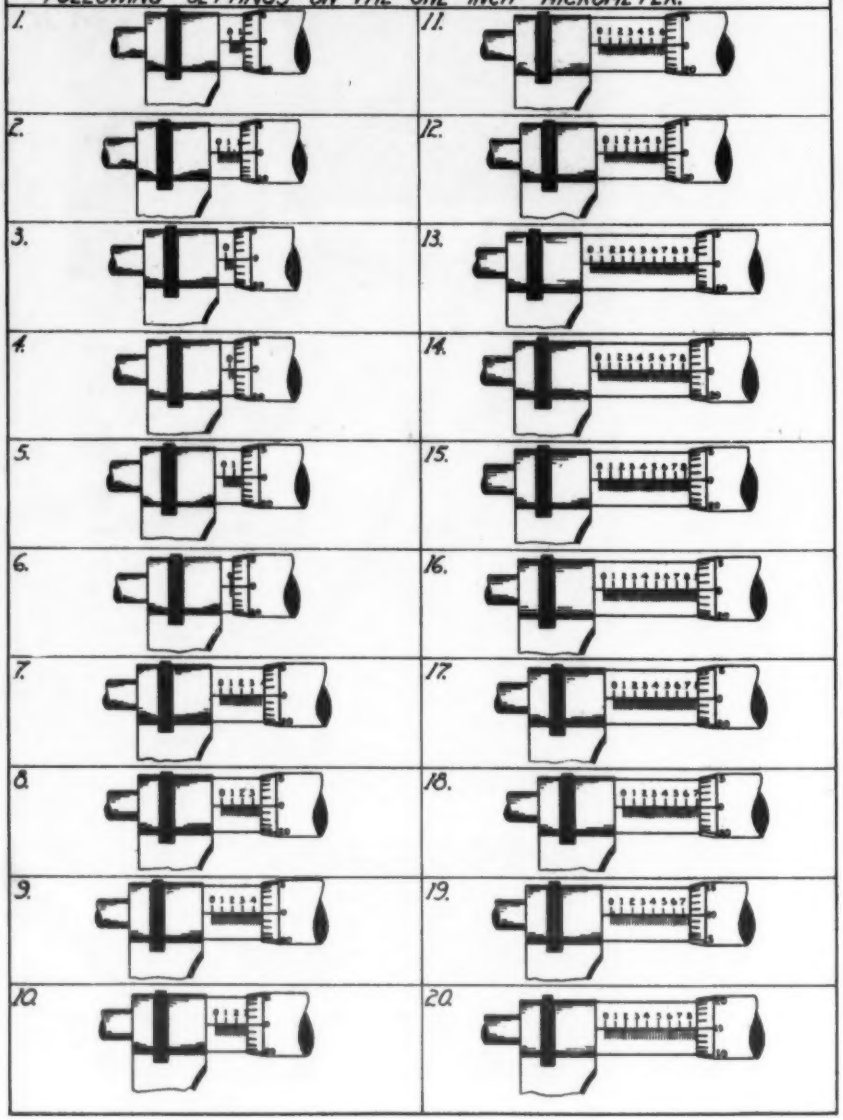
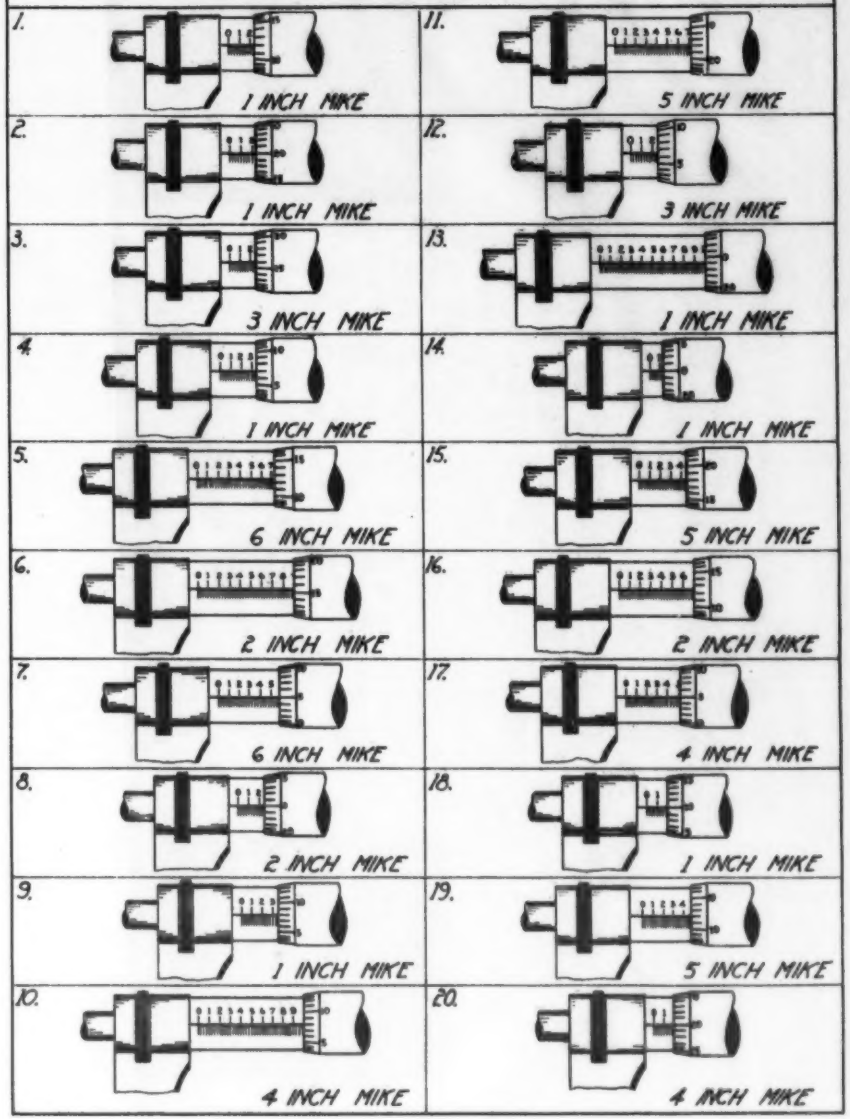
MICROMETER READING TEST No. 1

WHAT ARE THE READINGS IN THOUSANDTHS OF AN INCH OF THE FOLLOWING SETTINGS ON THE ONE INCH MICROMETER.



MICROMETER READING TEST No. 2

WHAT ARE THE READINGS OF THE FOLLOWING SETTINGS IN THOUSANDTHS


1. 1 INCH MIKE
2. 1 INCH MIKE
3. 3 INCH MIKE
4. 1 INCH MIKE
5. 6 INCH MIKE
6. 2 INCH MIKE
7. 6 INCH MIKE
8. 2 INCH MIKE
9. 1 INCH MIKE
10. 4 INCH MIKE
11. 5 INCH MIKE
12. 3 INCH MIKE
13. 1 INCH MIKE
14. 1 INCH MIKE
15. 5 INCH MIKE
16. 2 INCH MIKE
17. 4 INCH MIKE
18. 1 INCH MIKE
19. 5 INCH MIKE
20. 4 INCH MIKE

Submitted by Wm. T. Guenter, Eveleth, Minnesota

For Description See Page 170, Industrial Arts and Vocational Education, May, 1932

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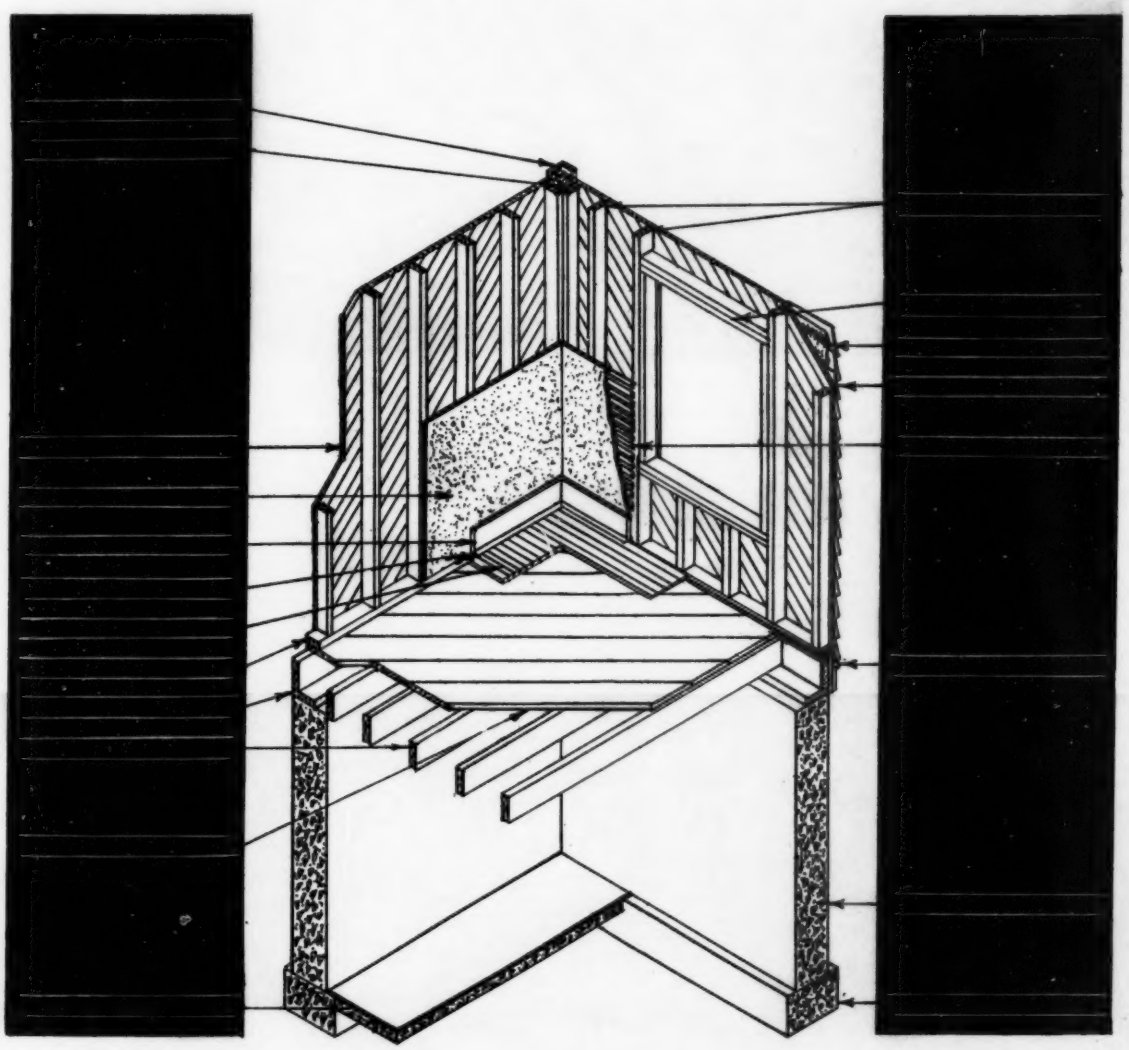
ARCHITECTURAL DRAWING

TEST NO. 2

STUDENTS ARE TO FILL IN THE NAME, SIZE, & SPACING OF EACH PART OF THE ISOMETRIC SECTION SHOWN BELOW. YOU WILL BE GRADED ON NEATNESS, LETTERING, AND ACCURACY



STUDENT'S NAME [redacted]

Submitted by Ren Aton, Michigan City, Indiana

classes, one of which has been using a different textbook and following a different organization of instruction. Validity can be secured by careful selection of questions during the progress of the course and not at the immediate time the test is to be given.

A test is said to be reliable if it measures exactly and consistently the thing that is being measured. If the same test is given more than once to the same group of pupils and consistently gets the same result or nearly so, all other factors being equal, the examination is said to be reliable. Reliability is a matter of degree. If a test is given two or more times to the same group of students and the results show a high coefficient of correlation, it is said to be reliable. Reliability is very important in the successful construction of objective tests.

Objectivity is determined by the fact that two or more teachers may mark the same test and get the same mark. An objective test differs from a subjective examination in that the teacher's mark on the former cannot be influenced by personal feeling, disposition, or opinion; while in the subjective type this undesirable condition may prevail.

Tests may be divided into three classes: (1) the essay type, (2) the informal objective type, (3) the standardized test type.

The essay type usually is very subjective. It has many disadvantages, some of which are:

1. There is low validity because of limited sampling.
2. Questions selected depend in part upon the teacher's point of view at the time. Different days produce somewhat different sets of questions.
3. Too little time is spent by the average teacher in choosing and wording the questions.
4. Personal equation always enters in the grading of the test and therefore lowers reliability.

The standardized tests include such tests as: (1) Intelligence or Psychological tests, (2) Aptitude tests, (3) Personality tests, (4) Character-Trait tests, (5) Interest tests, (6) Certain standard achievement tests both in academic subjects and trades. These tests are standardized because norms have been established by giving the test to a great number of students. The student's rank can be determined by giving him any particular standardized test and then comparing his result with the standard norms. These tests are very objective.

Standardized tests in industrial arts are now available in the field of woodwork,[1] mechanical drawing,[2] and home mechanics.[3] There are also a number of ready-made informal objective tests on the market which have not as yet been standardized.[4]

The industrial-arts teacher should be particularly interested in the use of standardized objective tests, but he also will find use for informal tests which he can construct himself, and which may be used as an effective means of evaluating the products of learning in any particular class or subject.

The informal objective tests may be classified into two groups: (1) recall, (2) recognition.

Two forms of the recall type are: (*a*) Simple recall; (*b*) completion.

The simple recall type of question is probably best adapted to situations in which the answer can be made in one word. *Example:* How many revolutions does an automobile crankshaft turn in making a cycle? Two . *Another* situation in which the simple recall type of question can be used is in the relating of tools and their use. *Example:* The tool used for enlarging the diameter of a round hole in a piece of cast iron is called a Reamer . This type of question is quite readily adaptable to almost all of the industrial-arts subjects.

The completion type of question is somewhat similar to the simple recall and is adaptable to the same kind of situations. In this type of question two or more words are omitted from a sentence and the pupil is required to complete the sentence by filling in the right words. *Examples:* The tool used to bore holes in wood is called a Bit and is held in a Brace which when being used is turned in a Clockwise direction.

The alternating current used in ordinary lighting circuits changes its Direction 60 times a Second.

Some advantages of the simple recall and completion types of questions are:

1. Relative freedom from effects of guessing or chance.
2. Well adapted to thought questions.
3. Permit wide sampling of subject.
4. High validity and reliability.

Some disadvantages are:

1. Difficult to make questions entirely objective.
2. Tendency to include questions based on minor and unimportant details.

Nine forms of the recognition type are:

1. True-false
2. Multiple-choice
3. Best-answer
4. Matching
5. Similarities
6. Cross-out
7. Procedure-arrangement
8. Comprehension
9. Performance

I. *The true-false type*

This type of question is adapted to testing the pupils' knowledge of tools, processes, and related technical information.

Examples:

1. The ripsaw is used to cut the grain. True ___ False x
2. Cast iron is softer than tool steel. True x False ___

Some advantages of the true-false type are:

1. Can be adapted to most forms of subject matter.
2. Easily and quickly scored.
3. Permits wide sampling of subject.
4. High reliability and validity.
5. Fairly easy to construct.

Some disadvantages are:

1. Much opportunity for guessing.
2. Danger of making statement of question absurd.
3. Restricted to questions that can be answered by "Yes" or "No."

NOTE: In computing the score of a true-false test the number of wrong answers should be subtracted from the number of right answers. This compensates for guessing by the pupils.

II. *The multiple-choice type*

This type is somewhat similar to the true-false type and questions may be easily transposed from one of these forms to the other. It is especially adapted to testing the pupils' knowledge of tools and their uses.

Examples:

1. The ripsaw is used to cut (1) Across the grain, (2) with the grain, (3) curves, (4) circles.

[1]Nash, H. B., and Van Duzee, R. R. *Industrial-Arts Tests, Test I, Woodwork.* The Bruce Publishing Company, Milwaukee, Wis.

[2]Nash, H. B., and Van Duzee, R. R. *Industrial-Arts Tests, Test II, Mechanical Drawing.* The Bruce Publishing Company, Milwaukee, Wis. Fischer, F. A. P. *Mechanical Drawing Tests.* The Bruce Publishing Company, Milwaukee, Wis. Castle, D. W. *Mechanical Drawing Test.* Manual Arts Press, Peoria, Ill.

[3]Newkirk and Stoddard. *Home Mechanics Tests.* Bureau of Educational Research and Service, University of Iowa, Iowa City, Iowa.

[4]Hunter, W. L. *Shop Tests — Series No. 1 and No. 2.* Manual Arts Press, Peoria, Ill. Wells, G. K., and Laubach, M. L. *Industrial Arts Tests in the Fields of Mechanical Drawing, Woodwork, Printing, and Machine Shop.* Manual Arts Press, Peoria, Ill. Patrick. *Industrial Arts Test.* Public School Publishing Company, Bloomington, Ill.

2. The tool used by electricians for bending a conduit is called a (1) Crow bar, (2) jimmy, (3) hickey, (4) pinch bar, (5) spanner.

Some advantages of the multiple-choice type are:

1. Guessing is practically eliminated if four or more response items are used.
2. Preferred by students.
3. More objective scoring is possible.

Some disadvantages are:

1. Tends to be highly factual.
2. Difficult to get sufficient number of responses that are not absurd.

III. *Best-answer type*

This type of question is especially adapted to situations in shopwork, in which it is necessary for the student to make a choice of methods, tools, or processes. The student indicates his choice of best answers by numbering each statement in order of his choice as: for best answer, No. 1, next best, No. 2, etc.

Examples:

1. Paint rather than varnish should be used on an outside door because:

a) It will look better..... (3)
b) It is cheaper..... (2)
c) It will stand the weather better.. (1)
d) It is easier to put on..... (4)

2. Six-cylinder cars run more smoothly than four-cylinder cars because:

a) The throws on the crankshaft are closer together (2)
b) The firing strokes occur more often..... (1)
c) There is less vibration in the motor..... (5)
d) The crankshaft is better balanced..... (3)
e) There are two more pistons..... (4)

Some advantages of the best-answer type are:

1. Permits the use of long response statements which stimulate students to more thought and judgment.
2. Tests ability to think in terms of materials of the course.

Some disadvantages are:

1. Difficult to prepare.
2. Can be made too definite so that it becomes the end rather than the means of the pupils' thinking.

IV. *Matching type*

This type of question is best adapted to testing knowledge of tools and processes, but can also be used on related information. It is also very well adapted to testing a pupil's knowledge after the completion of a unit of work in a shop course. One of the single words is matched with one of the statements to which it belongs to make that statement true.

Example: zinc, dry cell, sal ammoniac, rubber, copper, series connection.

Dry cell generates current electricity.
Rubber is a good insulator.
Series connection gives a higher voltage.
Sal ammoniac is a common form of electrolyte.
Zinc makes a good electrode material.
Copper is a good conductor of electricity.

Another slightly different form of the matching type of test is matching of single words. Words in first column are matched with related words in second column by numbering.

Example:

1. Drill	4. Horizontal line
2. Tap	3. Per inch
3. Threads	5. Sharp black line
4. T square	2. Wrench
5. 4H pencil	1. Chuck

Some advantages of the matching type are:

1. Provides training in the discovery of the relationship of cause and effect.
2. May be used as either judgment or factual tests.

Some disadvantages are:

1. If pairs to be matched are few in number guessing enters.
2. Difficult to construct with clear-cut discrimination.

V. *Similarity type*

This type of question may be used to determine the students' knowledge of meaning and relationship of various parts of tools, equipment, or materials or the relationship of one of these items to another item. Four words are placed together in the group. The first word is in some way related to another word in the group.

Examples:

1. Plane, saw, rule blade.
2. Auger bit, clamp, saw-horse, twist drill, hammer.

Some advantages are:

1. Highly objective.
2. Easy to score.
3. Clear discrimination in meanings and relationship of items, words, tools, materials, etc.

Disadvantages are:

1. Subject to guessing if less than four words are used.
2. Tends to be highly factual.
3. No provision for problem solving or reasoning.

VI. *Cross-out type*

This type of test is adapted to practically the same purpose as the matching and similarity types. The word in the group which is not associated with the other words in the group is crossed out.

Examples:

1. Stain, varnish, solder, paint, shellac.
2. Driver pulley, driven pulley, belt, saw, shaft.

Advantages of the cross-out type are.

1. Very objective.
2. Easily scored.
3. Student must have similarities and relationship definitely in mind.

Some disadvantages are:

1. Hard to get one word out of place and yet not absurdly misplaced.
2. Does not tell where thinking ends and guessing enters.

VII. *Procedure-arrangement type*

This type may be adapted to testing the pupils' knowledge of the chronological order of procedure in a given job or the order in which processes are performed in making a finished product. It is especially adapted for use in mechanical drawing, machine shop, auto mechanics and wood finishing.

Example:

List in order the steps necessary to make an ink tracing from a pencil mechanical drawing:

1. Fasten drawing on drawing board.
2. Fasten tracing cloth or paper over drawing.
3. Ink in all arcs and circles.
4. Ink in all horizontal lines, working from top to bottom.
5. Ink in all vertical lines, working from left to right.
6. Ink in all oblique lines.

Another kind of the procedure-arrangement type of questions is one in which the procedure is listed and numbered. The student should rearrange these numbers to show the correct order procedure.

Example:

To remove starting motor from Model T Ford car:

1. Remove the four starting-motor mounting screws.
2. Remove outer bendix stud bolt.
3. Pull bendix assembly from armature shaft.

4. Remove bendix cover cap.
5. Remove starting motor.

(4) (2) (3) (1) (5)

Some advantages of the procedure-arrangement type are:

1. Provides for definite reasoning or problem solving on the part of the student.
2. Provides training in analyzing a complete job.
3. Gives training in concrete planning of a job.

Disadvantages are:

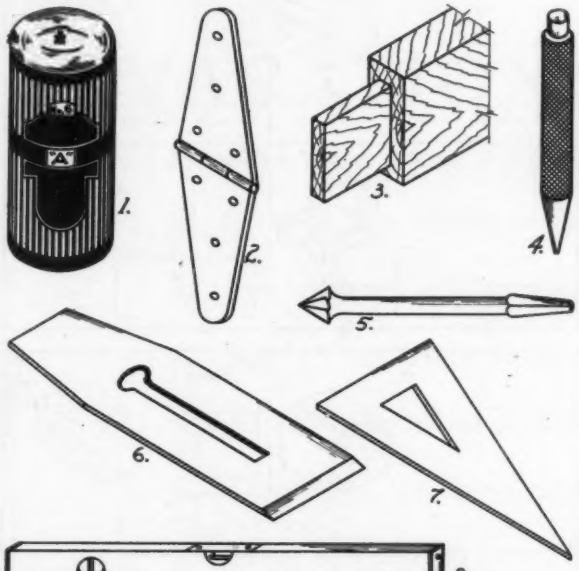
1. May not be entirely reliable.
2. May not be entirely objective.
3. Can be used only in upper grades.

VIII. *Comprehension type*

This type of question involves the use of pictures or drawings and is particularly adapted to testing the students' knowledge of tools, and materials and their uses.

Example:

Give the name and use of each of the articles shown in the picture.



Name	*Use*
1.	1. .....
2.	2. .....
3.	3. .....
4.	4. .....
5.	5. .....
6.	6. .....
7.	7. .....
8.	8. .....

Some advantages of the comprehension type are :

1. Fairly objective and reliable.
2. Discriminates clearly between tools and their use.
3. Guessing is eliminated.
4. Provides training of the visual sense in recognizing facts in pictures.

Some disadvantages are:

1. Tends to be highly factual.
2. Difficult to prepare.
3. Takes up too much space.
4. Takes a great deal of time to prepare.

IX. *Performance type*

This type of test is particularly adapted for testing the skill of the pupil in any industrial-arts course. The method of evaluating the result of such a test is very important. An example of this type of test would be to have the student make an ink tracing of a pencil drawing supplied by the teacher. This would test his performance ability in inking a drawing. In evaluating the student's work, his result would be compared with a standard, made by the instructor. The instructor's tracing would be set up as perfect. The students' tracings that matched his in every detail would receive a perfect score. On the other tracings, a point would be subtracted for each error in the width of lines, imperfect corners, imperfect connection of lines and arcs, improperly made arrowheads, etc.

Some advantages of the performance type are:

1. Highly reliable, valid, and objective.
2. Tests skills as well as related information.
3. Highly diagnostic of students' skills and related information.
4. No chance for guessing or "bluffing."

Some disadvantages are:

1. Difficult to prepare.
2. Scoring takes much time.

The contention has been that objective tests are not adapted to testing the ability of the pupil to solve new problems. On the contrary, many of the types of objective tests are extremely well adapted to the formation of problem-solving questions.

The problem-solving part of any test is necessarily incorporated in the method and way in which the question is stated. The person who is making the test must keep in mind or visualize problem-solving factors and so state the question that when it is answered these factors will operate rather than remembered facts. Problem-solving questions in objective tests are probably new but they can be made valid, reliable, and objective. At least this type of question is worthy of careful consideration as the possibilities are unlimited for their use in industrial-arts courses.

Examples of Problem-Solving Questions

The true-false type

A permanent magnet can be used in an electric bell.

True _____ False X

Procedure-arrangement type

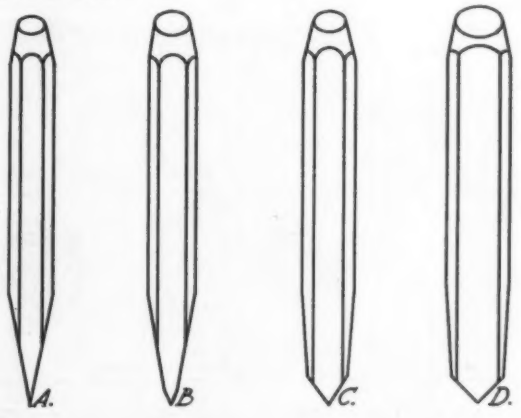
Indicate briefly and in order the steps you would use in putting a finish on a book rack so that it will match the finish on your library table at home:

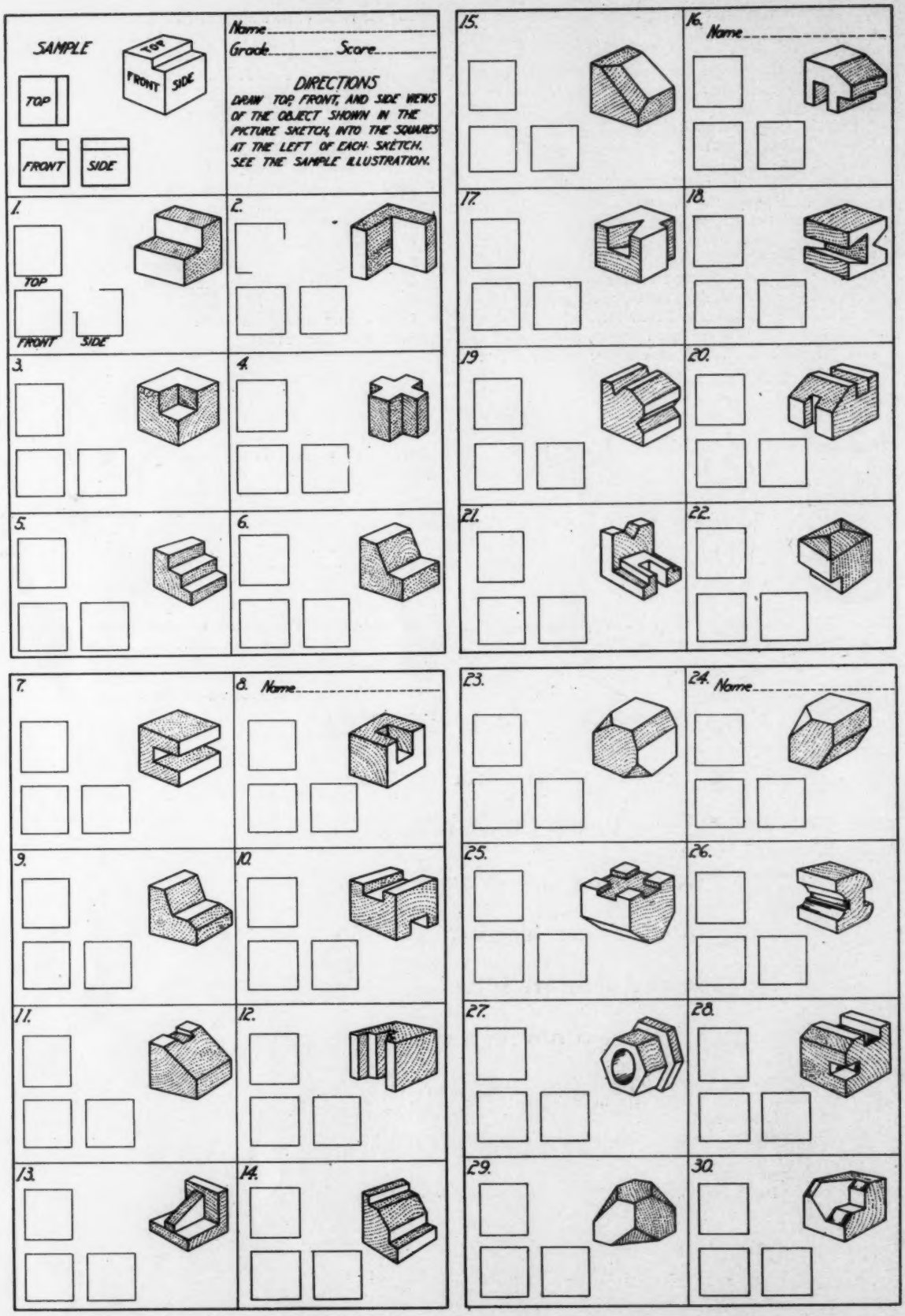
1. .....
2. .....
3. .....
4. .....

Etc.

Comprehension type

Which one of these cold chisels would you use for heavy machine work?





MECHANICAL-DRAWING TESTS, SUBMITTED BY M. R. KLEIN, NATHAN HALE JUNIOR HIGH SCHOOL, CLEVELAND, OHIO

Slogan: No Accident This Vacation

VACATION CAUTIONS

1. Stay away from deep water until you can swim.
2. Sit still in a canoe or boat.
3. Wear shoes where there is danger of glass or nails.
4. Keep your fingers out of your mouth.
5. Always wash hands before eating.
6. Don't play in the street or road.
7. Wait at least an hour before swimming.
8. Firearms are always dangerous.
9. Hitching rides is risky.
10. Playing with fire is foolish.
11. Games need not be rough to be interesting.
12. Take care of little injuries at once.
13. Avoid wires—They may be hot.
14. Most accidents are avoidable.
15. Safe fun is the best fun.

Courtesy of National Safety Council,
Chicago, Illinois.

AMONG INDUSTRIAL-ARTS TEACHERS

¶ Mr. E. W. Manzer, supervisor industrial arts, Bronxville, New York, will teach a course in pewter craft at the summer session at Oswego Normal School, Oswego, New York.

¶ Mr. J. O. Loftin has been appointed director of the new Main Vocational and Technological School at San Antonio, Tex.

¶ Mr. B. H. Scott, of Grand Marais, Minn., has been appointed instructor of printing at Eau Claire, Wis.

¶ Mr. Walter Stewart, supervisor of manual training at Allentown, Pa., died at his home on January 24, at the age of 52. Mr. Stewart, who was one of the foremost advocates of industrial-arts work, had been supervisor of the work in the local schools for the past thirteen years.

¶ Mr. Atland Olson was reëlected president, and Mrs. Elizabeth De Clerc, vice-president, of the vocational board of Green Bay, Wisconsin.

¶ Mr. H. O. Eiken has recently been reëlected as director of the Green Bay, Wis., Vocational School for a term of three years. Miss Emma H. Toule, who has been appointed as assistant director, will continue her work as coördinator at the school.

¶ Mr. Claude M. Henry, 59, a member of the Federal Board for Vocational Education, died at Walter Reed Hospital, Washington, D. C., on March 18, after a long illness. Mr. Henry was appointed to the board in May, 1927, and had completed five years of valuable service.

ASSOCIATION AND CONVENTION NEWS

BOSTON VOCATIONAL SOCIETY HOLDS MARCH MEETING

The Vocational Education Society of Boston held its regular monthly meeting on Saturday, March 12, at the Hotel Westminster, Boston, Mass.

The speaker of the evening was Mr. Henry A. Sasserno, a former Boston teacher, who took for his subject, "Was Democracy on Trial?" In an attempt to show how the present state of affairs in government tends to keep the better type of citizen out of public service, Mr. Sasserno related some of his experiences in campaigning for the Boston school committee. Touching on the rising costs of government, Mr. Sasserno stated that in the past thirty years the government costs have risen 1700 per cent, while the population has increased only 25 per cent. The increased rates of interest that must be paid on short-term notes is but the price of inefficiency, he said. Mr. Sasserno told of his recent visit to Italy and admiringly described Mussolini, and his type of government. — *Louis Van Ham.*

WESTERN ARTS MEETING AT ST. LOUIS

The local committee on arrangements has announced the completion of plans for the meeting of the Western Arts Association, to be held May 3–7, at St. Louis. The New Jefferson Hotel has been selected as the headquarters for the meeting and accommodations may be obtained in eighteen hotels located in or near the convention headquarters.

The railroads have united in offering a special one and one-half fare rate on the certificate plan. Tickets at the normal one-way tariff fare for the going journey may be purchased on April 29 to May 5, depending upon the territory. A return ticket via the same route at one half the normal one-way tariff fare will be issued up to and including May 11.

A number of interesting side trips, which include theaters, art museums, zoos, schools and universities, libraries, parks, and boulevards, have been arranged.

The speakers are: Dr. Homer J. Smith, of the University of Minnesota; Dr. W. E. Warner, of the Ohio State University, Mr. Louis LaBeaume, of the American Institute of Architects; Florence Fallgatter, Dr. Herbert J. Spinden, Dr. Eugen G. Steinhof, and Mr. John L. Bracken.

CONFERENCE ON PRINTING

The Eleventh Annual Conference on Printing Education will be held June 27–29, at Harding Hall, of the Government Printing Office, Washington, D. C. The topic of discussion at the meeting will be "Printing, the Mother of Progress." The program for the Washington Bicentennial dinner meeting will devote itself to a study of printing in the life of the nation, with suitable addresses on George Washington, Benjamin Franklin, and the Public Schools and Industry. There will be a special foreign exhibit of fine printing and paper, together with 45 exhibits from 21 different countries.

Information concerning the meetings and the speakers may be obtained from Mr. F. J. Hartman, director of the department of education, Washington, D. C. — *Frank K. Phillips.*

OSWEGO BOYS' CLUB HOLDS MEETING

The Oswego Normal Boys' Club held its annual meeting on March 5, at the Men's Faculty Club, Columbia University, New York City. It was the largest gathering of graduates in some time and proved enjoyable. Mr. Harold MacDonald acted as toastmaster.

The first speaker of the evening was Dr. L. A. Wilson, assistant commissioner of vocational and extension education, who spoke of the high esteem in which the Oswego Normal School is held and traced the rapid development of industrial arts at the school, which has culminated in the erection of the new building and the removal of the class from the basement of the old building.

Dr. Withers, of New York University, discussed the reasons for the present depression and told how everyone can assist in ending it.

Dr. Ralph Pickett, of the same institution, gave some of the high lights of the Department of Superintendence Meeting at Washington.

The officers elected for next year, are: Dr. R. L. Burns, of Cliffside, N. J., president; Mr. R. J. Petermann first vice-president; Mr. John Faber, second vice-president; Mr. Clifford Brownell, third vice-president; Mr. Kenneth Hunter, secretary; Mr. Gene Whitcomb, assistant secretary; and Mr. Kenneth Little, treasurer.

NORTH CAROLINA VOCATIONAL SOCIETY MEETS AT CHARLOTTE

The North Carolina Vocational Education Association held a meeting on Friday, March 18, at the Technical High School, Charlotte, with Mr. Roy Thomas acting as chairman. About eighty persons were present at the meeting.

Mr. T. E. Brown, state director of vocational education, opened the meeting with a talk on "Learning Units in Vocational Education." Mr. Roy Palmer, an illuminating engineer, gave an illustrated talk on "The Proper Use of Light in the

(Continued on page 14A)

NEW!

Stanley "Boy-Proof" Mitre Boxes

1 Swivel and Uprights are cast in one piece from malleable iron which is practically unbreakable. Malleable iron castings are also used for the legs and saw guides.

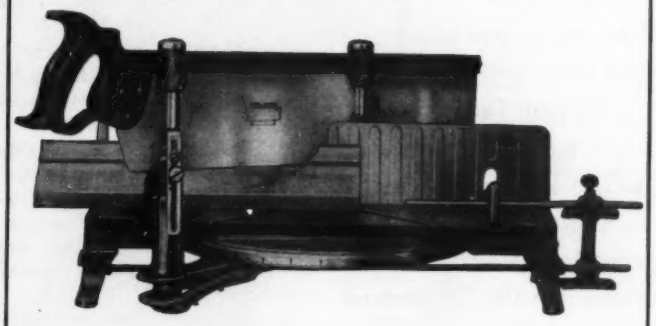
2 Automatic Saw Guide Catches hold the saw above the work so that both hands are free to place the work in position. These catches also stop the saw guides from coming out of the uprights.

3 Two roller bearings in each saw guide produce a smooth saw action.

4 Automatic Lift Screw raises the front Saw Guide and Saw out of the kerf cuts when changing swivel position.

5 Positive Saw Guide Stops and Depth Stop Plates control the depth of the saw cut. Serrated teeth on the uprights and on the stops together with strong screws and lock washers will withstand the severe school shop use.

THE new Stanley Mitre Boxes take their places in the ever increasing line of "Boy-Proof" Stanley Tools designed especially for the school shop. A review of the distinctive features of these new Mitre Boxes will prove their adaptability for use in your shop.



6 Quadrant is graduated in degrees and is also numbered for sawing 3, 4, 5, 6, 8, 12 and 24 sided figures. The double locking, self-clamping swivel is fitted with a pin which locks into the numbered index holes. The swivel will also lock at any position between these holes.

7 A minimum of removable parts — a bolt and nut on the end of the Saw lock the Saw in the Saw Guides. The uprights and saw guide parts are securely fastened together by strong screws and lock washers — and the number of parts has been greatly reduced.

These sizes are recommended for Elementary, Junior and Senior High School shop work:

No. 2244—24″ x 4″ Saw, capacity at right angles 8¼″, capacity at 45°, 5½″.

No. 2246—26″ x 4″ Saw, capacity at right angles 8¼″, capacity at 45°, 5½″.

This size recommended for Vocational School shop work:

No. 2358—28″ x 5″ Saw, capacity at right angles 9½″, capacity at 45°, 6½″.

Complete information on these new Mitre Boxes will be furnished upon request.

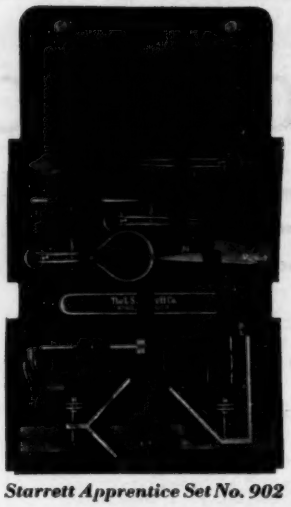
THE STANLEY RULE & LEVEL PLANT
EDUCATIONAL DEPARTMENT
New Britain, Conn.

STANLEY TOOLS

Stanley Equipment is Standard Equipment

USE STARRETT HACKSAWS

Tell your boys about this NEW SET

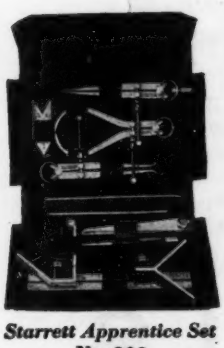


Starrett Apprentice Set No. 902

Do you remember the first real tools you ever owned — the pride, pleasure and downright *inspiration* they gave you? Sure you do! Plan now to give your boys the same advantage.

Look over the new Starrett Apprentice Set No. 902; you will find in it every tool the beginner has to have, in one handy case. Look over the individual tools and you will find that every one is the kind you would pick for yourself — a genuine Starrett, selected from the regular Starrett line. No. 902 is a kit anyone would be proud to own.

For a complete description of Starrett Apprentice Set No. 902 and information on other popular sets, write for our free Apprentice Folder CE.



Starrett Apprentice Set No. 900

THE L. S. STARRETT CO.
World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy
Athol, Mass., U. S. A.

Use Starrett Tools

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(Continued from page 176)

Classroom, Shop, and Home," explaining the effect of color and color combinations in lighting.

The afternoon meeting took the form of an industrial-arts, trade-education, and industrial-group meeting, with Mr. G. W. Coggin as chairman. Mr. C. S. Mills, Greensboro, talked on "Costs and Returns of Industrial-Arts Courses in Junior High School," Mr. E. T. Howard discussed "Helpful Instruments for the Promotion of Industrial Arts," and Mr. J. W. Smith took up the subject, "Anchoring Industrial Arts."

NEW JERSEY VOCATIONAL ASSOCIATION HOLDS MEETING AT ASBURY PARK

The New Jersey Vocational and Arts Association held its sixteenth annual convention March 17–19, at Asbury Park, with Dr. Ernest Kent, Jersey City, presiding.

At the opening session, Mr. M. L. Lowery, of Middlesex county, discussed "Vocational and Arts Education from the County Superintendent's Viewpoint"; Mr. Waldo Wright, Scranton, talked on "Education and the Ship"; and Mr. Arthur B. Wrigley made the presentation of the commercial exhibitors.

At the general session on the second day, Dr. R. L. Cooley, Milwaukee, Wis., spoke on "The Scope and Objectives of Part-Time Vocational Schools," showing films of the work of the Milwaukee Vocational School. A number of sectional meetings were held for supervisors and directors, home economics, art, printing, continuation, industrial-arts, and vocational-guidance teachers.

The convention closed with a business session and the election of officers for the coming year.

INDUSTRIAL EDUCATION DIVISION OF OKLAHOMA MEETS

The industrial education division held its annual meeting in connection with the Oklahoma Education Association, February 4–6, at Oklahoma City. Mr. H. W. McKimmey, of Oklahoma City, presided.

Mr. E. R. Sifert, Oklahoma City, discussed "The Need for Vocational Guidance in the School Program"; Mr. J. F. Owen talked on "Education on the Job"; and Dr. Edwin A. Lee, of Berkeley, Calif., read a paper on "Vocational Education and Unemployment." There were a number of sectional meetings for general-shop, auto-mechanics, agricultural, and vocational teachers.

The meeting closed with the election of the following officers: President, Mr. C. C. Jelks, Sand Springs; vice-president, Mr. O. M. Martin, Shawnee; secretary-treasurer, Mr. John Dryden, Oklahoma City. The executive committee consists of Mr. H. A. Allender, Bristow, on industrial arts, and Mr. Fred Heisler, Ponca, on trades and industries.

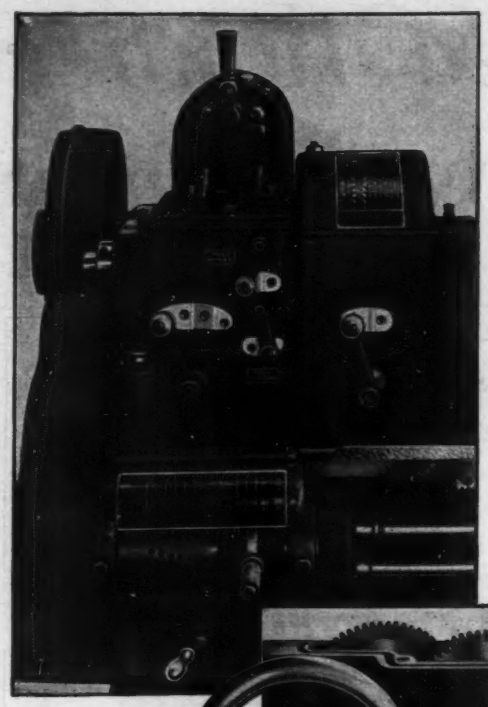
NEW PUBLICATIONS

Portfolio of Block Prints

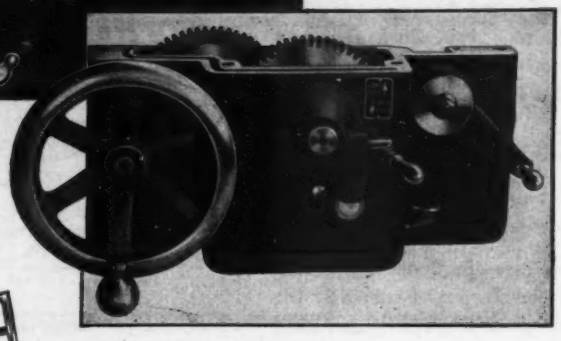
By William S. Rice. Loose-leaf sheets, 17 plates, 10½ by 13. Price, $2. Published by The Bruce Publishing Company, Milwaukee, Wis.

This collection of block prints contains unusually fine specimens. They have been made by a master, and are worthy of study by teachers and students of art. The subject range is quite large. Mr. Rice traveled through Alaska, Arizona, California, France, Germany, Italy, New Mexico, Pennsylvania,

(Continued on page 18A)



ANY PAIR OF HANDS CAN OPERATE THE SUPER REGAL



SIMPLE, safe feed control . . . one interlocked trip lever for carriage and cross slide movement . . . all speed and feed controls within easy reach of left hand.

Eight-speed selective geared headstock, helical gears, reversing and compounding feed gears inside of headstock. Box type one-piece apron with the rack pinion and hand wheel rolling on ball bearings, all running in oil. One shot lubrication to cross slide and bed ways and cross slide screw bearings.

The operation of the Super Regal is simple beyond any lathe you've seen, giving it a safety of operation you and the student will appreciate. Its unusual accuracy merits your approval.

Illustrated descriptive literature sent on request. Slip that inquiry into the mail today.

A VALUABLE book for the student. Seventy pages telling about modern methods of lathe operation—grinding, centering, attachments, cutting speeds, machinists' tables, leveling a lathe, checking the motor, correct lubrication, making tests, etc. A wealth of information told in simple language.

Book sells for 25 cents. Sent free to any instructor when requested on school letterhead. Write for your copy—no obligation whatever.

REGAL lathes are made in five sizes, 10" to 18". The Super Regal is made in two sizes, 12" and 14". Prices range from $276.00 to $947.00, F.O.B. factory. Each lathe comes equipped with motor, ready to run. Also large face plate, small driving plate, steady rest, graduated compound rest, tool post, collar and wedge, taper spindle sleeve, lag screws and washers, foundation plan, instruction book, centers, and necessary wrenches.

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CINCINNATI, OHIO

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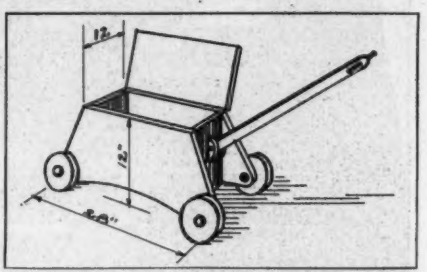
This laminated lumber than ordinary

Douglas Fir Plywood also gives you advantages of light weight, warp-resistance, easy workability... and panel sizes up to four feet by eight feet!

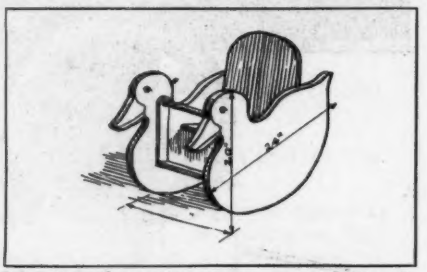
THE marked economy of Douglas Fir Plywood makes it particularly adaptable for every kind of manual training project, elementary or advanced. It has all the true, easy-working qualities of soft lumber, but will not split, splinter, shrink or swell. It can be planed and sanded like solid boards — and given any wood finish.

It is ideal for camp kits, cupboards, modern furniture, dressing tables, breakfast nooks, benches, screens — in short, wherever large-size, true-working boards are needed.

New working plans and perspective drawings of interesting Douglas Fir Plywood projects have been prepared specially for instructors. Check the coupon on the opposite page — and mail today!

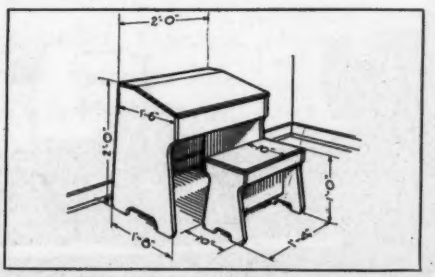


CHILD'S CART: *Another elementary project that students will enjoy taking home to a small brother or sister. Made of Douglas Fir Plywood, it will stand a lot of hard wear.*

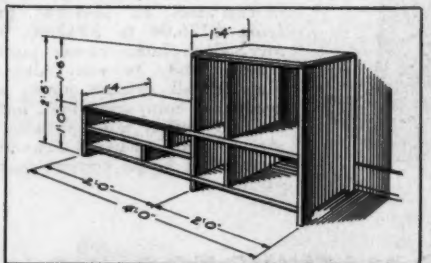


DUCK ROCKING CHAIR: *Douglas Fir Plywood's wide, strong, lightweight panels speed up the job and make it split-proof as well as warp-resistant.*

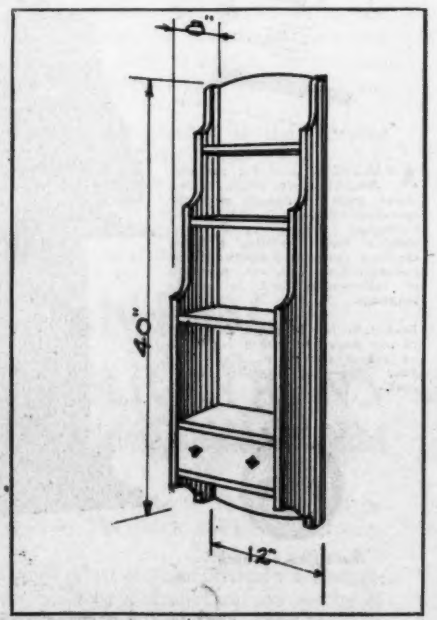
Douglas Fir Plywood is made from the finest selected logs, cut into thin sheets and built up in three or more plies, cross-grain, to prevent splitting and twisting.



CHILD'S DESK AND BENCH SET: *A practical project — and a welcome gift for a young brother or sister. Douglas Fir Plywood makes it strong, warp-proof, light and easy to move about, and inexpensive to build.*

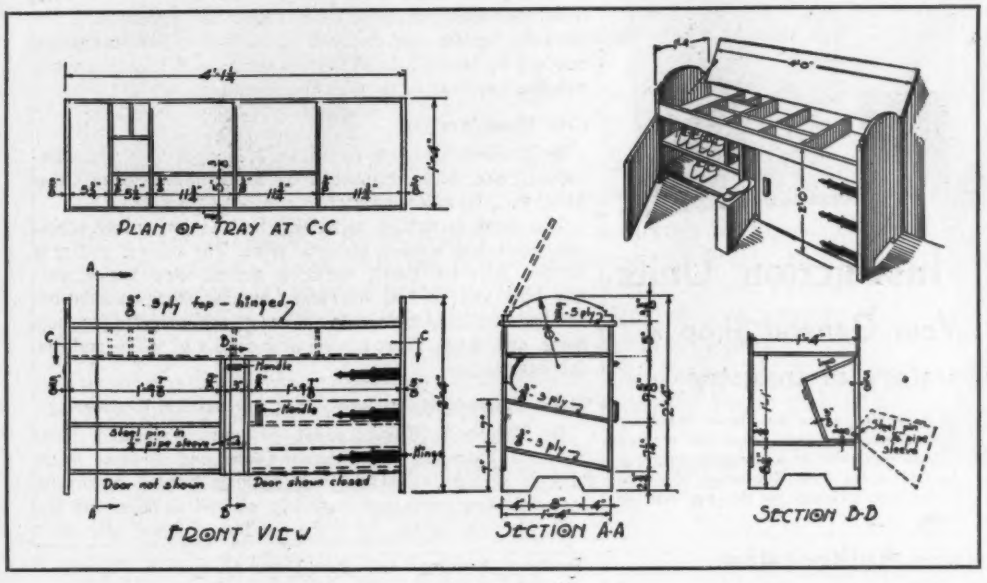


MODERN SIDE TABLE: *Ideal for books, magazines, and bric-a-brac. Inexpensive and quickly built with Douglas Fir Plywood — and may be given any wood finish.*



WALL RACK: *Compact, space-saving, useful in any home. No other material makes it as light in weight yet as strong as does Douglas Fir Plywood.*

costs LESS *per project solid boards!*



BOUDOIR CHEST AND SEAT: *Easy to make of Douglas Fir Plywood. Generous space — compactly arranged — for stockings, lingerie, shoes, hats and other articles.*

Order Douglas Fir Plywood from your local lumber dealer!

Why not give *your* students the benefit of this versatile material?

Alert teachers everywhere are using Fir Plywood for practically *every* manual training job — for tool boxes, tie racks, radio cabinets, basket-ball goals, magazine racks, card tables, bread boards, and similar articles.

Remember, Douglas Fir Plywood comes in convenient-size panels up to 4 feet wide and 8 feet long, and in various thicknesses—3/16", 1/4", 3/8", 1/2", 3/4" or thicker — to suit the needs of any job.

Supply your stock-room now! Your own lumber dealer probably carries an assortment of Douglas Fir Plywood in stock — or will be glad to order for you at current low prices.

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REAL LUMBER
Engineered for greater size and strength

Blueprints Available!

Note: **Small-scale working drawings of all these projects will be sent free. Larger size blue prints are available at cost—10c each. Check the ones you want, below, and mail coupon.**

- ☐ Boudoir Chest and Seat
- ☐ Dust-proof Enclosure for Ash Can
- ☐ Dust-proof Hat Box
- ☐ Child's Non-tippable Stepladder
- ☐ Modern Side Table
- ☐ Running Board Camp Kit
- ☐ Auto Camp Kit for LongerTrips
- ☐ Low Running Board Auto Camp Kit
- ☐ Broom Closet and Ironing Board
- ☐ Breakfast Nook
- ☐ Corner Cupboard
- ☐ Wall Rack for Lawn and Garden Tools
- ☐ Duck Rocking Chair
- ☐ Laundry Cabinet
- ☐ Handy Man's Tool Cabinet
- ☐ Utility Locker
- ☐ Seed and Bulb Storage Cabinet
- ☐ Child's Desk and Bench Set
- ☐ Clothes Hamper
- ☐ Smoking Stand
- ☐ Chest
- ☐ Pier Case
- ☐ Modern Stand
- ☐ End Table
- ☐ Child's Chair
- ☐ Magazine Rack
- ☐ Magazine Stand
- ☐ Clothes Chute
- ☐ Child's Cart
- ☐ Wall Rack

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*State*_____

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☐ Also I enclose.....c for blueprints checked above, at 10c each.

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Enrich your shop activities with the aid of this adequate teaching material so that your students will gain a clear conception of technical requirements.

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Gasoline Automobiles	66 pp., 36 illus.,	$.50
Gasoline Automobile Engines, 2 parts	90 pp., 60 illus.,	.75
Automobile Bench Work	64 pp., 73 illus.,	.50
Elements of Electric Ignition	72 pp., 54 illus.,	.55
Electric Lighting Devices	70 pp., 45 illus.,	.60

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(Continued from page 14A)

Scotland, and Washington to gather the material represented in this portfolio.

Mr. Rice is by no means a beginner at this type of work, having been represented in numerous print exhibitions, both in this country and abroad. He is at present head of the art department of the Castlemont High School, Oakland, Calif.

Motor Vehicles and Their Uses

By Edward S. Fraser and Ralph B. Jones. Cloth, 411 pages, 6 by 8⅛, illustrated. Price, $2.50. Published by D. Van Nostrand Company, Inc., New York City.

This is the fourth edition of this handbook on the care, repair, and management of motor trucks and automobiles. The book was written as a textbook for courses in auto mechanics, but will be found helpful by the garage man and by anyone who has anything to do with the automobile.

Cold Metal Working

By E. Perry Van Leuven. Cloth, 275 pages, 6 by 9⅛, illustrated. Price, $2.25. Published by McGraw-Hill Book Company, Inc., New York City.

This book is written especially for the junior-high-school and high-school student of metal work. The subject matter is divided into six parts, covering general-shop regulations; sketching and reading drawings; making stock calculations and layouts; shop tools and equipment; and projects for shop, home, and camp. There is also an appendix of tables and useful information.

Model Builders' Manual and Junior Aeronautical Engineering

By Thomas L. Bulger. Paper, 62 pages, illustrated. Price, 50 cents. Issued by the *National Glider and Airplane News*, New York City. The pamphlet contains helpful descriptive material about tools and materials, as well as plans and layouts, for those interested in the building of model aircraft.

Teaching Evening and Part-Time Classes in Vocational Agriculture

By G. A. Schmidt and W. Arthur Ross. Cloth, 278 pages, 5⅜ by 8. Price, $2.25. Published by The Century Co., New York City.

The authors have succeeded in covering the problem of adult agricultural education in a comprehensive way. The book will be found to be of great assistance to those intrusted with the teaching of evening classes in rural districts in organizing and carrying on their classes. The subject matter throughout makes the impression that it is not merely a theoretical discussion, but that it has been written by men who have had practical, first-hand experience with that which they are discussing.

Wisconsin Directory Issued

The Wisconsin Industrial Arts Association has issued a directory of its membership. The booklet contains the list of Wisconsin teachers and is intended to be of service to those interested in promoting courses of study. Mr. L. F. Stacker, Green Bay, is president of the association; Mr. Earl Thrall, Beloit, is vice-president; and Mr. R. R. Van Duzee, West Allis, is secretary-treasurer.

The officers of the Association have had a conference with the State Department of Public Instruction, in which plans for a coöperative effort to improve industrial-arts work throughout the state were discussed.

George Washington's Life

A symphony in silhouettes. By Max Chambers. Prepared and published by the author at Preston, Md. This pamphlet, which has been approved by the Maryland Commission for the bicentennial anniversary of Washington, consists of a vivid, sparkling Washington program for schools. The material is arranged in eight parts and includes notes and suggestions for presentation in classrooms and school auditoriums.

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To teach Art-Fibre Furniture Weaving.

Our simple step by step work sheets save you long hours of study, because while actually making useful pieces of furniture, you learn the few fundamentals necessary.

The work is so fascinating and practical that teaching it becomes a joy. Students, while developing mind and body in this interesting way, become enthused and eager because the projects are so easy and quickly made.

Solves Shop Equipment Problem

by furnishing complete projects, properly and accurately machined, all necessary tacks, screws and nails, braces, glides and weaving materials. All ready for you to start to work. Best of all only a small hammer and pair of wire cutters are needed to build complete suites of furniture.

It is easy to prove what many other schools have already proven. Let us send you this waste basket as a trial project. The cost is insignificant compared to the satisfaction of knowing for yourself. Right now is the best time to send us your trial order.

GRAND RAPIDS FIBRE CORD COMPANY
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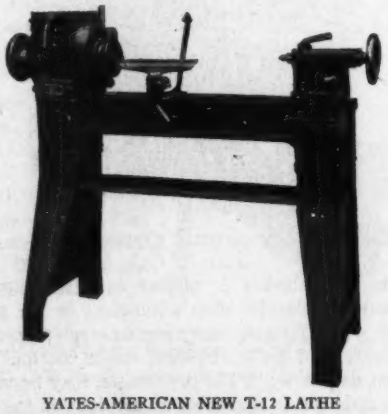
WASTE BASKET—B14
COMPLETE $1.00
Plus 4 lbs. Postage

SCHOOL SHOP EQUIPMENT NEWS

FOR THE SUPERVISOR OR TEACHER WHO DESIRES TO KEEP ABREAST WITH THE NEWS OF NEW MACHINERY, TOOLS, SUPPLIES, ETC.

THE NEW YATES-AMERICAN T-12 SPEED LATHE

The Yates-American Machine Company, of Beloit, Wis., is marketing its new T-12 speed lathe. It is beautifully designed and accurately built, and is equipped with a number of safety



YATES-AMERICAN NEW T-12 LATHE

devices which make this new lathe particularly suitable for school-shop use. Some of these are: (1) motor will not start when speed-control lever is accidentally moved; (2) motor can be started by pushing start button, but only when control lever is at lowest-speed position; (3) top of push button does not project, thus preventing accidental starting; (4) application of the brake automatically shuts off the current; (5) tool-rest adjustment clamp is conveniently placed in front; and (6) spindle can be locked for changing faceplates.

Besides being a safe lathe, it is an accurate piece of machinery that can be easily operated. Complete information may be had on request.

NEW STANLEY HAND DRILLS

The Stanley Rule and Level Company, New Britain, Conn., has just placed on the market three new "boyproof" hand drills which have been designed especially for the school shop.

NEW HAND DRILL

The new drills contain concealed jaw springs which prevent the drill bit from jambing, a powerful three-jaw chuck, a strong, light-weight steel frame, machine-cut gear and pinion teeth, and an idler gear assuring smooth, easy action. The chuck is securely locked on the spindle. The drill has a long crank handle and a large comfortable frame handle which insure firm grip and easy operation.

The firm also announces a new miter box, which comes in three different sizes. The box is strong, simple, accurate, and boyproof. It contains automatic saw-guide catches to hold the

Continued on page 22A)

Sturdy Steel

Pat'd and Pat's Pending

Fig. 484 — "HALLOWELL" Bench-Leg of Steel, for steel and wood tops. Exceptionally rigid. 30 sizes.

The "HALLOWELL" Work-Benches of Steel are so popular because, unlike wood, they are strong, rigid, wobble-proof and easy to keep spotlessly clean in addition to being fire-proof and quite inexpensive.

And the "HALLOWELL" will last a lifetime and becomes, if anything, more serviceable with age.

To meet the constantly growing demand we carry 1368 different sizes and combinations of "HALLOWELL" Steel Benches in stock for prompt shipment.

We show below 3 of the 1368 combinations.

FULL DATA IN OUR BULLETIN 445

Pat'd and Pat's Pending

Fig. 732

"HALLOWELL" Work-Bench of Steel.

Made of hard, smooth steel throughout. Excellent metal-working Bench. Vise not shown. Drawer is extra. Fireproof. Finished in Olive green. Shipped from stock.

WRITE US.

Pat'd and Pat's Pending

Fig. 924

"HALLOWELL" Steel Work-Bench.

Laminated Hardwood plank in front. Very popular with Die and Tool makers. Vise not shown. Drawer is extra. Finished in Olive green. Shipped from stock.

WRITE US.

Pat'd and Pat's Pending

Fig. 928

"HALLOWELL" Steel Work-Bench.

Beautiful hardwood Top. Open below to facilitate sweeping. Vise not shown. Drawer is extra. Finished in Olive green. Shipped from stock.

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STANDARD PRESSED STEEL CO.

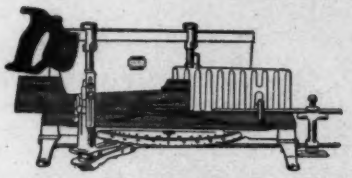
BRANCHES BOSTON CHICAGO DETROIT

JENKINTOWN, PENNA.
BOX 552

BRANCHES NEW YORK SAN FRANCISCO ST. LOUIS

(Continued from page 21A)

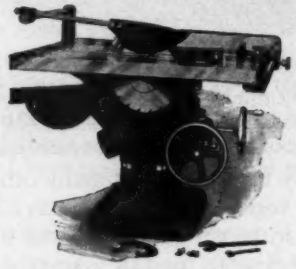
saw above the work, a swivel lever and lift screw for automatically raising the saw from the kerf cuts, a saw guide for controlling the depth of the saw cut, a quadrant graduated in degrees and indexed for cutting multisided figures, a double-



clamping device for holding the swivel at the desired index holes, and many other valuable features.

NEW OLIVER SAW BENCH

The Oliver Machinery Company, Grand Rapids, Mich., has announced its No. 70 Variety Saw Bench for high-school use.



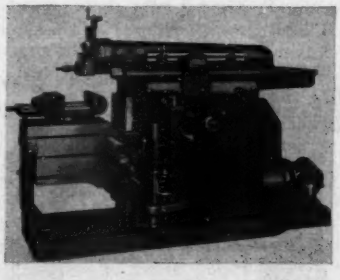
THE NEW OLIVER No. 70

The Oliver No. 70 Saw Bench is a precision machine, with considerable capacity. It is ball-bearing throughout, and is modern in design and construction. The machine is designed and built for ripping, cross-cutting, and dadoing, and is equipped with an automatic saw guard, antikick back catch, full electric protection. It has a motor-on-arbor drive and operates at 3600 r.p.m.

Complete information and prices may be obtained by any school-shop instructor upon request.

NEW ROCKFORD HY-DRAULIC SHAPER

The new Hy-Draulic shaper, just placed on the market by the Rockford Machine Tool Company, Rockford, Ill., is the first shaper having hydraulic ram drives and feeds.



HY-DRAULIC SHAPER

This shaper embodies a number of basic improvements which insure substantial shop advantages in the production of shaper work. It maintains constant tool pressure in the cutting stroke, and has a simplified stroke control. The number of ram strokes up to 150 per minute, may be varied with quickness and ease. It is capable of any feed up to .160", provides for control of the direction of table movement, has an automatic stop for feed and rapid traverse of the table, and for power elevation or cross travel of the table, as well as

(Continued on page 24A)

An Outstanding Example of Economy

for the School Shop

The same motor can be used either as a portable router, or in a stationary machine such as a shaper table, combination router and shaper and hinge arm router.

With the R5A Machine your shop is equipped to do dovetailing, inlaying, drop leaf cuts, thumb mold cuts, and to cut all types of moldings and two-tone work.

Folder C-15 gives full description
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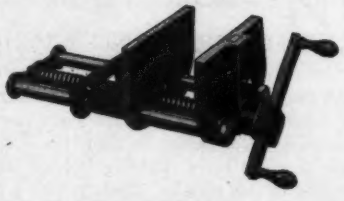

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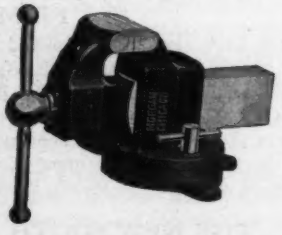

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Even With Reduced Budgets

schools can still afford *the best*

WOODWORKING MACHINES

You can afford the *best woodworking machines* for your school shop, *even* if budgets have been reduced. It is fortunate that WALLACE Machines, recognized by nearly 950 schools as ideal school shop machines, are *LOW COST.* As a matter of fact—you could not buy better machines for your school if you were to spend three times the cost of Wallace Machines.

The reason is simple. The work done in school shops is cabinet work — *not* planing mill work. To do cabinet work, schools choose cabinet shop machinery — just as industry does. Wallace Machines are cabinet shop machines that have been *accepted by schools* and *industry* to such an extent as to make J. D. Wallace & Co. the *World's largest* builders of portable woodworking machines. Vast production schedules permit economies that enable us to offer *better built machines at low prices.*

It is fortunate that *you need not sacrifice quality* in your woodworking machines—or do without machines because of decreased appropriations. You will be pleased to learn how far a modest investment will go toward equipping a shop, or adding that machine you need, with safe, efficient Wallace Machines. Interesting information concerning this will be gladly sent to you. Simply mail the coupon.

J. D. Wallace & Company
140 S. California Ave., Chicago

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J. D. WALLACE & CO.,
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Name .....

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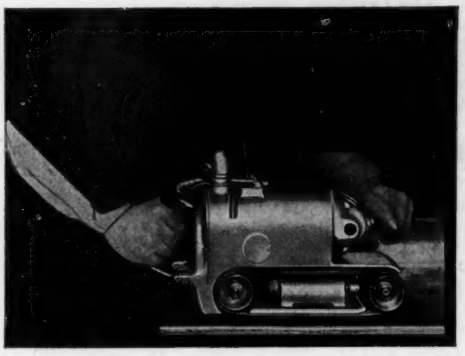
Do You Want to Make Extra Money This Summer?



Each year many vocational men spend a profitable summer refinishing desks, seats, tables, and blackboards with this new DUSTLESS TAKE-ABOUT Sander. The TAKE-ABOUT method is so easy and speedy that this work can be done at a fraction of its former cost. No time is spent dismantling the desk—refinish it right where it is. Then, there are slate blackboards which must be renewed. The TAKE-ABOUT removes the gray film, giving the board a new, natural black finish, and smooths up the joints besides. Ideal for all types of refinishing and new work because the smooth, even action of the belt leaves a beautiful finish without ripples or wave marks.

After it has earned its small cost doing maintenance work, put it in your manual training shop, where your students will be delighted, as it eliminates tedious, uninstructive hand-sanding.

Send for full descriptive circular on the TAKE-ABOUT today. When you get this information, approach your superintendent on this subject of refinishing. You will find him more willing than ever to listen to new methods of reducing costs—and your own summer employment problem will be solved.

BELT SANDER

Augments large machine at small investment. Type B-9 has two speeds, is dustless, all ball-bearing and safe. Investigate!

16-IN. BAND SAW

Meets every school shop requirement in Band Saw work. Ball-bearing, smooth running and reasonably priced. Also 14" and 20" models.

TYPE S-1 SPINDLE SANDER

Quickly changed from oscillating to non-oscillating. Runs from light socket. Ball-bearing throughout. Just the Sander for the shop.

FREE SCHOOL CATALOG

Sent on request. Contains latest specifications on Belt, Disc and Spindle Sanders, Band, Table and Bench Saws, Jointers, and other woodworking equipment. Send for your copy now.

Porter-Cable-Hutchinson Corporation 1702 N. Salina St., Syracuse, N. Y.

PORTER-CABLE-HUTCHINSON PORTER-CABLE-HUTCHINSON PORTER-CABLE-HUTCHINSON

Summer Schools (continued)

METAL CRAFTS
SUMMER SCHOOL
July 5th to 30th
under the direction of
AUGUSTUS F. ROSE

A four weeks course of intensive training including all processes involved in Jewelry, Silver, Copper, and Pewter Work. Saw-piercing, soldering, casting, carving, engraving, chasing, melting and rolling, etching, enameling, raising and spinning. Students may elect any or all subjects.

Sixteen states represented last summer.

For particulars address

DIRECTOR OF THE SUMMER SCHOOL
RHODE ISLAND SCHOOL OF DESIGN
11 Waterman St. Providence, Rhode Island

(Continued from page 22A)

for a reversal direction of the stroke at any point by means of a special handle.

The Hy-Draulic shaper is accurate, strong, rigid, and durable and is a first-class machine in every respect. It is built for a wide range of speeds and feeds, the operating adjustments are made without the use of tools, and the power consumption is remarkably low.

Complete information will be furnished to any shop instructor who requests it.

NEW DOUGLAS FIR PLYWOOD BOOKLET

The Douglas Fir Plywood Manufacturers, Skinner Building, Seattle, Wash., have issued a booklet entitled *Facts About Douglas Fir Plywood* which describes the characteristics, properties, sizes, grades, and uses of this wood. Directions and suggestions for finishing Douglas Fir Plywood for both exterior and interior use also are given.

This booklet is available to all who may be interested.

ISSUE BOOKLET ON GRINDING WHEELS

E. C. Atkins & Company, of Indianapolis, Indiana, have just issued a 30-page booklet, illustrating and describing the use and selection of Atkins grinding wheels for every requirement. The booklet provides information on abrasives, bonding processes, and shapes of wheel faces. Bakelite bonded wheels are prominently featured in this booklet. There is also a table of operating speeds and a stock list with prices.

A copy of the booklet will be sent to any shop instructor.

NEW WOODWORKING MACHINERY FIRM

Mr. Earle Hart has established the Earle Hart Woodworking Machinery Company with offices in the Machinery Sales Building, 565 West Washington Blvd., Chicago, Ill. In addition, an office is maintained in Detroit, with Mr. L. B. Heffner in charge. The Hart Company will represent eight or ten of the leading manufacturers of woodworking machinery in thirteen states of the Middle West.

THE NEW SOUTH BEND LATHE BOOKLET

The South Bend Lathe Works of South Bend, Ind., has just issued a new edition of its booklet *How to Run a Lathe*. This valuable little handbook contains 160 pages of shop hints and more than 300 photographs and drawings, besides a list of more than 300 jobs in blue-print form which the firm has available for the use of instructors and students.

The booklet will be sent to any shop instructor upon request.

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NEWS — NOTES

PLEASE NOTE

General Metal Work, by Grayshon, is published by the D. Van Nostrand Co., Inc., New York City, and not by the Manual Arts Press, as was erroneously stated in Mr. Grayshon's article entitled "Introductory Lesson in Sheet-Metal Work," in the April issue of this magazine.

Vocational School Assists Welfare Work

The girls of the home-economics department in the Vocational School, Racine, Wis., have accomplished some fine results in the remodeling of clothes donated for the poor. The girls have also sewed quilt pieces which are to be made into fine quilts.

Vocational Club at Benwood, W. Va.

A vocational club has been organized in the Union High School at Benwood, W. Va., with Mr. Louis Riedel as adviser. The club has more than 50 members and the boys are taking up aviation, machine-shop work, and electricity as activities.

Vocational Guidance Over Radio

The National Advisory Council on Radio in Education has inaugurated a radio series of vocational-guidance programs designed to help graduates and the general unemployed to find work suited to them. The series of eight programs in charge of the country's noted experts in vocational guidance will be broadcast by 80 stations of the Columbia Broadcasting System.

$5,000 Cash-for-Designs Offer

The Douglas Fir Plywood Manufacturers, Skinner Building, Seattle, Washington, are announcing a nation-wide $5,000 cash-for-designs offer, which is of great interest to all industrial-arts teachers. Entrants must submit sketches for designs embodying the use of fir plywood in industrial-arts projects, articles for home or office use, built-ins, traveling or camp accessories, or other commercial articles, on or before August 15, 1932. Sketches and descriptive material should be mailed directly to the Douglas Fir Plywood Manufacturers.

Measurement and Inspection Rules

Rules for the measurement and inspection of hardwood lumber, issued by the National Hardwood Lumber Association, Chicago, Ill., contains the rules for the measurement and inspection of hardwoods, cypress, veneers, and thin lumber.

Leather Belting Sold by Thickness

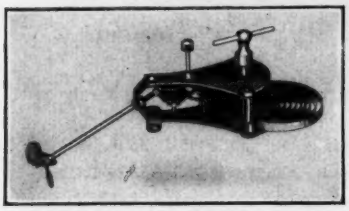
The American Leather Belting Association, 41 Park Row, New York City, has announced that leather belting will in the future be sold by thickness, instead of ounces per square foot. The change was made following a conference of manufacturers of leather belting throughout the county, and is in the direction of establishing higher standards for a product which has been sold by weight for a number of years. It also simplifies and makes easy the checking of each piece of belting for accurate thickness as specified.

The thickness specifications now in effect for first-quality leather belting are as follows:

Medium single,	10/64 in. to 12/64 in.
Heavy single,	12/64 in. to 14/64 in.
Light double,	15/64 in. to 17/64 in.
Medium double,	18/64 in. to 20/64 in.
Heavy double,	21/64 in. to 23/64 in.

The School Shop Shopping Guide

SPRING MOTORS



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Specify size and gauge.

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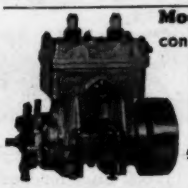

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An Ideal Project

"The most successful project we've ever found"—manual training teachers everywhere are saying of the new "Spirit of Time" Banjo Clock. It sustains interest. When completed, it affords the student constant satisfaction. Complete set, including dependable, guaranteed 8-day movement, silvered dial, eagle and parts for case—$1.75. Also ask about brass scrolls—$6.75. Complete knockdown

FREE BLUE PRINTS

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AMERICAN CHIME CLOCK COMPANY
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Vocational Teacher Says:
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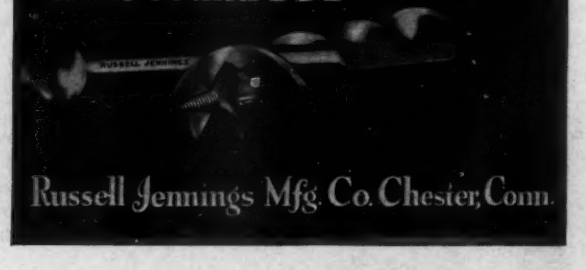
Genuine Russell Jennings Auger Bits have the full name on the round



Russell Jennings Mfg. Co. Chester, Conn.